DOCUMENT RESUME

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ABSTRACT

This student directed document contains five activity packages, a proposed curriculum, and a set of transparency masters; all pertain to field objectives 1, 4, or 5 of the Wisconsin Guide to Local Curriculum Improvement in Industrial Education, K-12. Geared to the junior and senior high school level, the packages are entitled: Co-op Program (defining school, business, and parent efforts to supply vocational training for students); Cleaning and Lubrication of Electric Motors (outlining the procedure and equipment necessary for the job); Geometric and Positional Dimensioning (supplying the experienced student with information, definitions, examples, references, and activities to help him gain competency in draftsmanship); Lab Maintenance Plan Development (outlining procedures for the upkeep and repair of equipment); The Enterprise (defining elements of business through media and information sections, activities, and student self-tests, and supplemented by an audiovisual presentation); and The Enterprise--An Alternative Delivery System (outlining activities geared to smaller groups, including procedures for setting up student businesses). Automotive Suspension, Steering and Braking, a proposed curriculum, outlines four sections of instruction giving length of time and areas spent for each; Elements of Industry, 50 transparency masters, are also included. (LH)

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CO-OP PROGRAM

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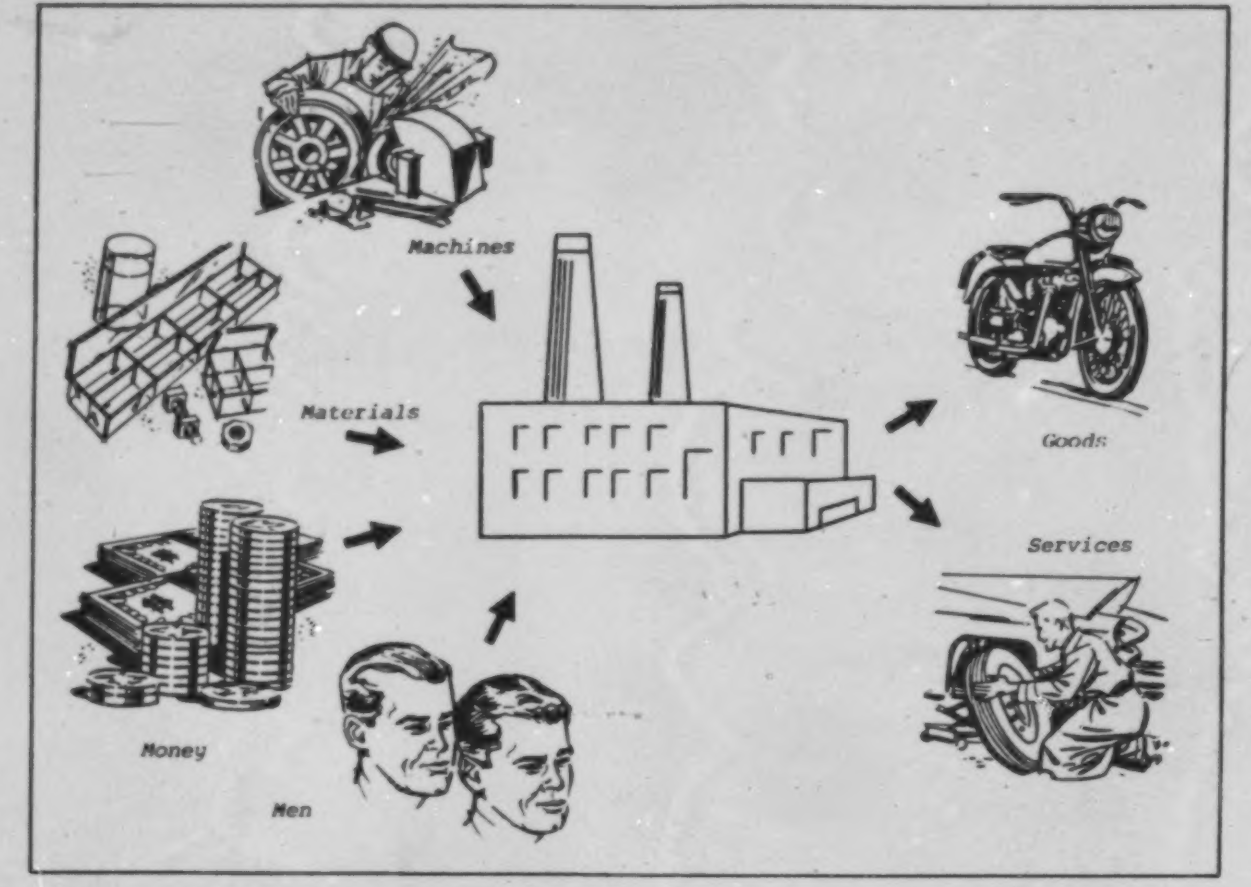

Prepared as an Aid in Implementing
The Wisconsin Guide to Local Curriculum
Improvement in Industrial Education, K-12

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Learning Activity Package

Prepared as an aid in Implementing
The Wisconsin Guide to Local Curriculum
Improvement in Industrial Education K-12

THE CO-OP PROGRAM

Earn While You Learn

Grade 12

Pertaining to Field Objective Number Four

"To explore occupational areas as a basis for selecting
a career and understanding the pursuits of others."

and the following elements of industry

Management Communications

Human Resources

Produced by:

The Industrial Education Instructional
Materials Development Project
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The Graduate College and Center for Vocational,
Technical and Adult Education
Both of the University of Wisconsin--Stout

To The Teacher:

Cooperative education can be defined as several parties cooperating together for the education of a student. These parties are generally the school, the student, the business, and the parent. The main purpose of cooperative education in this country has been primarily for the vocational education of students. The major rationale for this method of education, and it is a method, is that it is very difficult to duplicate in the classroom the many knowledges, skills and attitudes that can be learned on-the-job.

Cooperative education can help solve some of the following problems:

1. Youth need help in making the transition from school to work.

2. There is a need to appreciate human relations.

3. Students need to engage in a fundamental examination of life. In a cooperative education program, students begin to examine what they stand for in terms of ethics and goals.

4. Education must aim to make life meaningful. Cooperative education gives status to the student who wishes to engage in an occupation for which college education is not required. He tends to find commitment sooner under this type of education.

5. Cooperative education provides students an opportunity to learn their first vocational skills. A good coordinating teacher and an alert sponsor will teach them that they will need to continue throughout their lifetime to learn additional skills so that they may continue to be employable.

Cooperative education does integrate various knowledges, skills and attitudes. The pressure of the job for pay motivates the student to integrate such things as human relations, general knowledge, vocational skills, and acceptable attitudes toward work. Because of this, the student is motivated to learn daily from a competent coordinating teacher who has had both experience on the job in the real world of work as well as knowledge of attitudes and subject matter. Cooperative education also produces an integrated effect because parents, the student, the school, and the employer are aiming for the same goals for this student based upon his or her career objectives which are on file in the school. This unifies the various segments of the environment toward his or her objective. This is a situation that is difficult to simulate under just school and home environment.

Cooperative education in a vocational field such as distributive education or office occupations produces and improves self concept, for the following reasons:

1. The adolescent is taking his or her place in the adult world by holding down a wage earning occupation.

2. He or she is no longer a failure or at least no longer a nominal success in the highly verbally oriented school environment. He or she is developing success in his or her own right and is receiving regular classroom credit for his or her on-the-job success.

3. Generally, there is a youth-group organization in conjunction with the cooperative education program. This youth-group organization soon becomes well known in the school through its service activities. This helps the student achieve a desirable self-concept through acceptance by his or her peer group.

Cooperative education can have an effect on motivating the student. He or she sees the need for the competencies being developed in school for on-the-job success. He or she normally does well in the cooperative related class, but also in his or her other classes. There is little disagreement among psychologists that students must learn best through real life situations. This results in retention of knowledge, attitudes and skills being taught. In other words, the student must experience the subject matter.

The package should be studied by the teacher. You will probably want to use the training plan, training agreement and weekly report in your co-op program as written in the package.

It is up to the teacher-coordinator to locate training stations for the students. Be sure you are familiar with the requirements in the local and state guide for vocational education. If your program meets the requirements, you may be financially reimbursed through state and federal funds. (See your LVEC for this material.)

You, as a cooperative education instructor, should be granted one-half hour per week, per student in your program for coordinating time. You should also receive extended contract time of one week prior to, and one week following the regular school year in order to organize your program.

An advisory and steering committee should be organized to advise you and help you in your program. These committees should include teachers, community leaders, school administrators and parents.

To The Student;

This package will give you a unique opportunity to explore the Co-op program and to work closely with your instructor and a selected employer.

Your responsibility as a student in a co-op program is to become familiar with the various co-op programs that are available through your school. You will be expected to maintain your grades in other classes while gaining on-the-job training in a local business or industry.

Your instructor will supervise your activities and the employer's responsibilities. Your instructor will also inform your parents as to your progress. The employer will be responsible for providing you with "on-the-job training" and an evaluation of your work.

As you become involved in the co-op program, you will begin to depend on your instructor and your employer and they will depend on you.

Your first responsibility, then, is to become familiar with the co-op program. You can begin by reading this package. Let's start on page 4.

Rationale: (The rationale will tell you why cooperative education is important).

You are now reaching that phase in your education when employment opportunities and job selection become very important in order to plan for your future in the world of work and education.

Recently a program referred to as cooperative vocational education has been introduced at the high school level.

This package describes cooperative education and encourages your awareness of programs in your school. Since you have been selected to become a part of this educational experience, complete this package in order to more fully understand this method of vocational education.

Please read the following objectives carefully!!

Objectives

As a result of working through these materials, you will become familiar with the cooperative education program and what will be expected of your school, your employer, your cooperating teacher, and yourself as a co-op student. In addition, you will better understand what cooperative education is.

Directions:

Using the information in this package, and any other sources available, you will become familiar with the co-op programs in your school. You will select a possible career which you want to explore through the cooperative education program. You will be able to write a definition of cooperative education, and be able to list competencies which you will need for completion of the program.

Options:

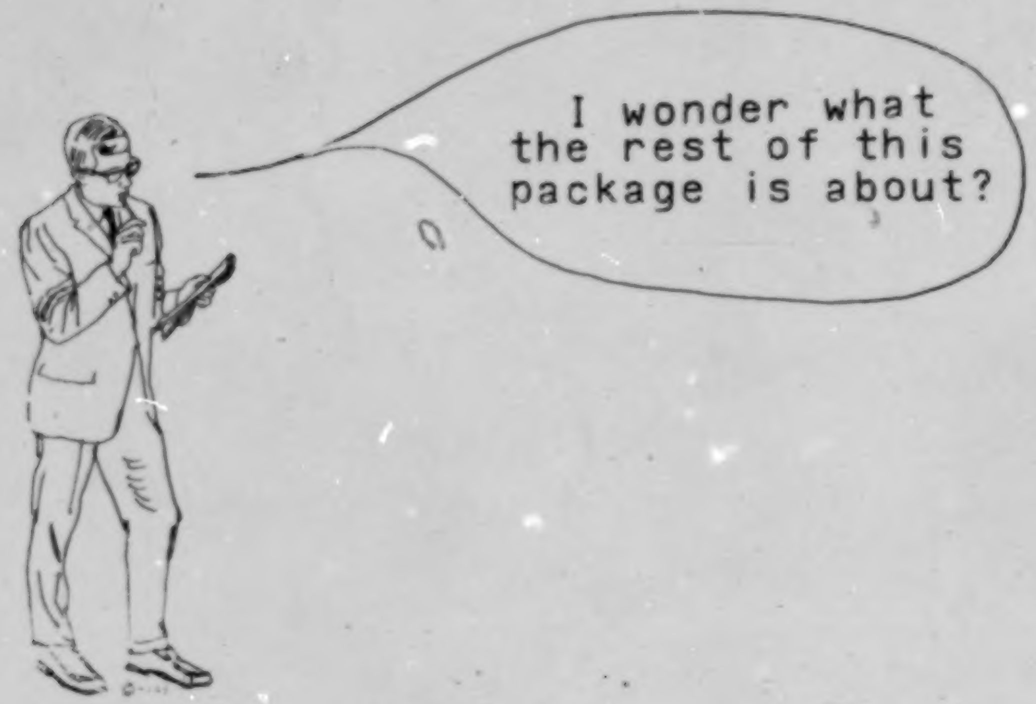
If you feel you can meet the objectives at this time, complete the required work and schedule a student-teacher conference.

If you feel you cannot meet the objectives, complete one or more of the following:

A. Complete this package by writing the pre-test. You should also read the content of the package and answer any questions. Then write the post-test and hand it in for evaluation.

B. Meet with a co-op teacher and discuss the co-op program of your choice to become familiar with it.

C. Write an essay about co-op listing possible careers you would like to work in during school hours outside of school. In the essay you should also include a definition of cooperative education and the roles of the student, work station and teacher!!!


I wonder what the rest of this package is about?

OFFICE MACHINES

Don't leave school before looking into the possibility of enrolling in a co-op program of interest to YOU!!!!

WOODWORKING

SHEET METAL WORK

Here is a test which will indicate to you how much you already know about co-op. After you have completed this pre-test, hand it in to your instructor. If you get 90% on it you are through with the package.

Give a definition of cooperative education.

List some of the subjects involved with cooperative education in your area of study.

List three jobs of interest to you that would be covered under the co-op program in your school.

1.
2.
3.

Select a career and tell why you are interested in it.

What will be required of you as a co-op student?

What can you expect from your employer regarding working conditions and privileges?

What can you expect from your cooperative education instructor, in and out of class?

Definition of Cooperative Vocational Education

Cooperative education can be defined as people cooperating, or working together, for the education of you the student. Those included are the school, the student, the business, and your parents or guardians.

The main purpose of cooperative education is to allow you to satisfy academic requirements (grades, credit, attendance) through an employment situation in your community. This will provide a new environment in which you can obtain the skills and attitudes needed to be a productive member of our society.

There are certain rules you must follow in order to stay in your program and keep your job. These rules are listed below.

THE STUDENT WILL:

1. Report promptly and engage in his assignment according to the training schedule.
2. Cooperate with the agency supervisor, engage in the assignment as a learning experience, observe business etiquette and keep safety rules.
3. Notify the school and agency in advance when absence is unavoidable.
4. Maintain satisfactory grades in all subjects in order to remain eligible for the program.
5. Furnish the coordinating teacher with all necessary information and complete all necessary reports.
6. Show honesty, punctuality, courtesy, a cooperative attitude, proper health and grooming habits, appropriate dress and a willingness to learn.
7. Remain with the employer during the training period except by agreement to all parties involved.
8. Abide by the rules and regulations of the cooperating agency.
9. Keep all business information of the cooperating agency confidential.

After reading the rules which apply to you, indicate below why you feel each rule is important.

1.

2.

3.

4.

5.

6.

7.

8.

9.

These reasons should be given for the student's rules.

1. Employers will want you to be to work on time. This is a real-job-like situation remember!!

2. One of the most important factors in keeping a job is being able to cooperate with all people involved.

3. If you notify the school and agency of an absence, it will clear your record and you will not be looked upon as an inconsistent worker.

4. Co-op is just right for you. The only way you can stay in it is to do well in all your classes. All classes are important to cooperative education.

5. You must obtain a work permit and a social security number in order to work.

6. Honesty, punctuality, courtesy, and a cooperative attitude are all virtues of a good worker.

7. Don't quit your job unless it is agreed upon by both you, your teacher, and your supervisor.

8. The cooperating agency has rules to follow, too. You must follow your rules if you expect the cooperating agency to follow theirs.

9. The cooperating agency has a right as private business to hold any private information confidential.

There are also rules for the employer. You aren't the only one that has to live by certain rules. Your employer should not grant you special privileges but he must follow guidelines.

THE COOPERATING AGENCY WILL:

1. Provide a training program, with varied experiences, which will contribute to the education of the student.
2. Provide a job sponsor for the training of the student.
3. Provide employment for the student during the agreed times.
4. Adhere to all Federal and State regulations.

After reading the rules governing the cooperating agency, explain below why each rule is important to you and your employer.

1.

2.

3.

4.

These reasons should be given for the employer's rules.

1. It is important that you learn all aspects of the job.
2. The company must provide someone who can teach you any thing you must know about the job.
3. The student and employer must live up to the contract.
4. Federal and State regulations must always be adhered to.

KEEP
MOVING

Your parents will probably be a big help to you because they have had past experiences that will make your situation easier. Why is it important for your parents or guardians to do their share?

THE PARENT OR GUARDIAN WILL:

1. Be responsible for the conduct of the student while participating in the program.
2. Be responsible for the method of transportation and for the student in delivery to and from his place of employment.
3. Provide time for conference with the coordinating teacher.
4. Become knowledgeable concerning the purposes and procedures of the training program.

If you follow the recipe, your program will be a great success!!!!

Your teacher also has some rules. These rules are listed below.

THE COORDINATING TEACHER WILL:

1. Visit and assist the employer with establishing the training program as it pertains to the student.

2. Observe the student on the job frequently.

3. Cooperate with the employer with evaluation of the student. Final evaluation is the responsibility of the school.

4. Make every attempt to solve problems that may arise from the cooperating agency, school, parent, student or community.

5. Provide meaningful in-school instruction related to the training activities of the student.

6. Work with a local advisory committee to obtain assistance with the program.

Now let's look at the training agreement on page 14. The training agreement lists all the information to which the student, parents, employer and teacher agrees. It lists the hourly wages and the times you will work. It includes the signatures of all involved.

Every worker must have a social security number. On page 13 of this package is the procedure for obtaining a social security number.

Those students who are under 18 must obtain a work permit from the state. Be sure to obtain this as soon as possible in order to become an employee.

OFFICE OF THE SUPERINTENDENT

WORK EXPERIENCE OF COOPERATIVE EDUCATION TRAINING AGREEMENT

Name of student-trainee: ______________________________

Name of Firm: ______________________________

Address of Firm: ______________________________

School: ______________________________

Occupational Title: ______________________________ (Use USOE Occupational Codes)

The employer agrees to cooperate with the school(s) to offer a varied training program. He further agrees to pay the student-trainee a beginner's wage of $____ per hour, furnish ratings of the student's on-the-job performance, and confer with the coordinating teacher periodically to determine in what way the student's training in school and on the job might be strengthened. (If a sub-minimum wage is issued, the school must show acceptance by the Wisconsin Department of Industry, Labor and Human Relations and the U.S. Department of Labor when applicable.)

The student-trainee agrees to perform to the best of his ability all duties assigned and conform to all rules and policies of his place of employment and the school. He expects no special privileges, agrees to be on the job every day (barring illness), and will confer with his coordinating teacher regarding any problems encountered on the job.

The parent or guardian agrees to cooperate with the school and employer to insure the best possible results from the student's training.

The work schedule will be from ____ to ____ Monday through Friday, from ______, 19__ to ______, 19__. In general, students should average a minimum of ten hours of work per week, not including Saturdays and school holidays. This average may be spread over an entire school semester or year. The students should not exceed 40 hours per week of school and work experience (total hours in class and on the job) Monday through Friday.

THIS TRAINING AGREEMENT DOES NOT SUPPLEMENT THE WORK PERMIT. STUDENTS MUST BE ISSUED A WORK PERMIT BEFORE STARTING HIS OR HER OCCUPATION TRAINING.

______________________________ (Student's Signature)	______________________________ (Employer's Signature)
______________________________ (Address)	______________________________ (Coordinating Teacher's Signature)
______________________________ (Parent's Signature)	______________________________ (Administrator's Signature)
______________________________ (Telephone)	______________________________ (Date)
______________________________ (Address)	

OFFICE OF THE SUPERINTENDENT

HOW TO OBTAIN A WORK PERMIT AND SOCIAL SECURITY NUMBER

WORK PERMITS

Every student under age 18 must have a permit to work.

Permits are obtained at: Secondary School Office

Items needed when applying for a permit:

1. A letter from the employer stating he is hiring you.
2. Permission, in writing from either of your parents or your guardian. This permission may be written on the letter from the employer.
3. A copy of your birth or baptismal record is required with your first application for a work permit. A copy of this birth record then remains on file and therefore it is not necessary to have it when applying for another work permit.

SOCIAL SECURITY NUMBER

A social Security Number may be obtained at

U.S. Social Security Office
424 Washington Avenue
Oshkosh, Wisconsin 54901

You may send to the above office and obtain your application for a number, or telephone them at 231-0840 and they will send you the application.

Students under 17 will be given a number upon application.

Students over 17 will have to wait approximately 10 days for their number.

It is not necessary for you to have your birth or baptismal record when applying for a Social Security Number.

IMPORTANT:

A Social Security Number is required by all employers.

You now should be familiar with the preliminary requirements of your co-op program. We must now look at the step-by-step training plan on page 16.

Whose signatures are required on the training plan? ____________________,

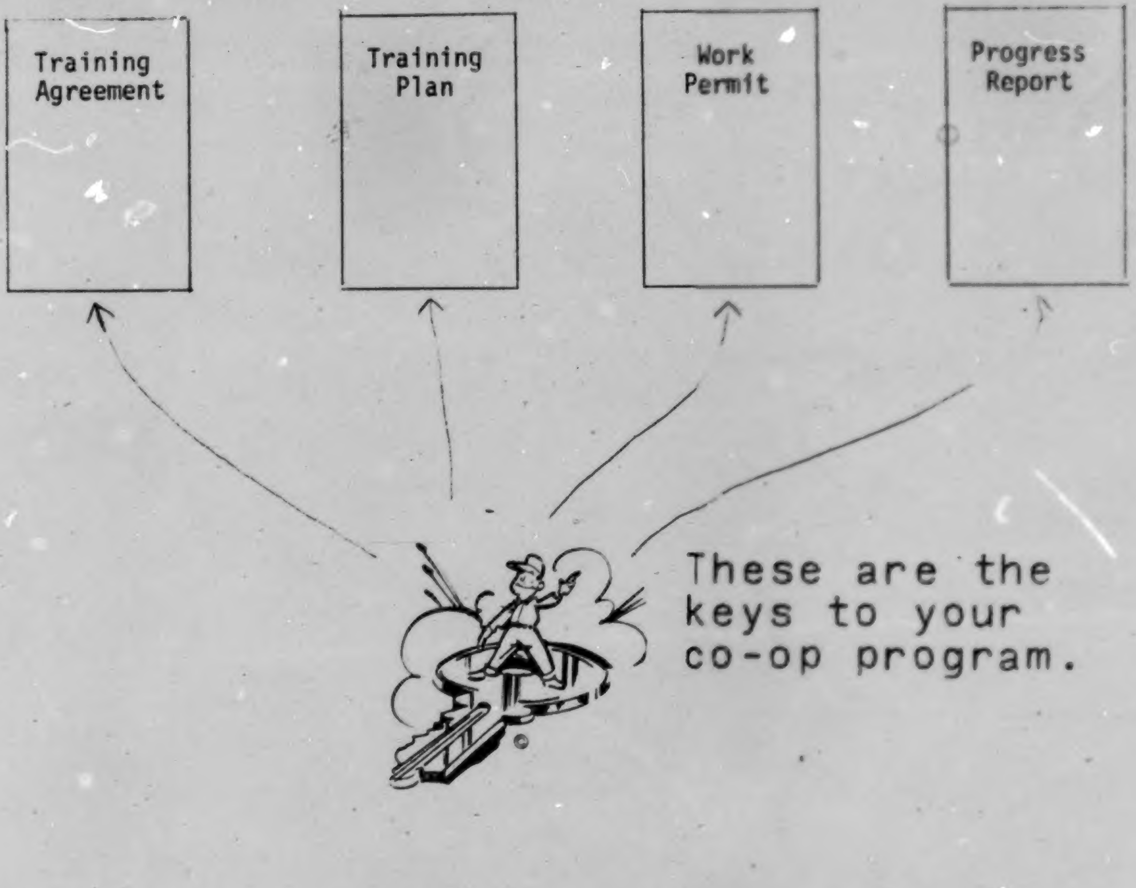
____________________, ____________________, ____________________.

The training plan describes the jobs you will be doing at work. It also lists your career objective and areas of experience and training.

The most important part of the training plan is that it lists the detailed areas of experiences and training while on the job.

On page 17 is the student's weekly progress report. Recorded on it are your hours and duties performed.

It gives a place to list absences and reasons for absence. It also gives attention to any problems you encountered during the week. Look the progress report over carefully.



These are the keys to your co-op program.

OFFICE OF THE SUPERINTENDENT

(Student) (Firm)

(School Year) (Teacher)

(Name of the Course)

STEP-BY-STEP TRAINING PLAN

I. DESCRIPTION:

II. CAREER OBJECTIVE:

III. AREAS OF EXPERIENCE AND TRAINING:

IV. DETAIL OF AREAS OF EXPERIENCE AND TRAINING

First __Weeks	Second _ Weeks	Third __Weeks	Fourth __Weeks

(Parent or Guardian) (Employer)

(Student) (Coordinator)

(Administrator)

STUDENT WEEKLY PROGRESS REPORT

Name ____

Firm ____

Training Sponsor's Name ______________________________

Week Dating from ______________ to ______________ Rate of Pay __________

Day	Time In	Time Out	Total Hours	Major Duties Performed
Monday				
Tuesday				
Wednesday				
Thursday				
Friday				
Saturday				
Sunday				
Totals				

____
(Signature of Employer)

Number of days absent from school this week ______________________

Did you report for work? ___Yes ___No Did you receive permission from your coordinator to go to work if you were absent from school? ___Yes ___No

If not, explain. ____

____

What problems arose during the week on which you would like help?

What mistakes did you make?

How did you handle the situation?

What individual training or instruction do you need to helpyyou perform you duties more effectively?

I would like a conference with the coordinator.

___Yes ___No

These hours and days worked are correct.

____
(Student's Signature)

Here's a key to helpful information.

Definitions

Cooperative Vocational Education:

Cooperative vocational education can be defined as people working together for the education of the student outside of the school. Those included are the school, the student, the business, and your parents or guardians.

Employee:

The employee is the student who is working on the job, outside of the school, to obtain skill and knowledge which will be useful in later employment.

Employer:

The employer is the hiring agency. The employer may or may not be the person who actually trains the student.

Social Security Number:

A number issued by the federal government for purposes of identification on tax forms and other federal work records.

Training Agreement:

An agreement between the school, teacher, employer, student, and parent and the relationships between them regarding employment of the student.

Training Plan:

A plan of instruction and work roles for the student while on the job.

Training Station:

The place of employment.

Work Permit:

A permit issued to those students under 18 by the state so they may obtain employment.

Employers usually have in mind certain qualities that they expect of their employees. If you were the employer, what qualities would you look for and/or require of someone who was working for you? Mark the approriate levels below with an X. (Example: high honesty, average courtesy)

	Below Average	Average	Above Average	High
Knowledge of the work situation:				
Honest:				
Dependable:				
Interested:				
Pleasant: Friendly:				
Courteous:				
Prompt:				
Attentive:				
Get along with others:				
Respectful:				

What are some additional qualities or abilities expected of an employee in your prospective job.

1. Ability to handle money and make change.
2.
3.
4.
5.
6.
7.
8.

Conclusion:

Cooperative education can be defined as people cooperating or working together for the education of you the student. Those included are the school, the student, the business, and your parents or guardians.

The main purpose of cooperative education is to allow you to satisfy academic requirements (grades, credit, attendance) through an employment situation in your community. This will provide a new environment in which you can obtain the skills and attitudes needed to be a productive member of society.

The student, cooperating teacher, employer, and your parents or guardians have rules to follow in order to make the program successful.

Important parts of every program are the agreements and plans which must be followed. The training agreement states what is expected of each party. The plan indicates what will be studied by the student and presented by the employer.

The student will be evaluated by the student weekly progress report. Review these agreements, plans and reports to be sure you understand them.

Go on to post test!!

When completed, hand it in to instructor.

GOOD LUCK!!!!

Post-test:

Give a definition of cooperative education.

List some of the subjects involved with cooperative education in your area of study.

List three jobs of interest to you that would be covered under the co-op program in your school.

1.

2.

3.

Select a career and tell why you are interested in it.

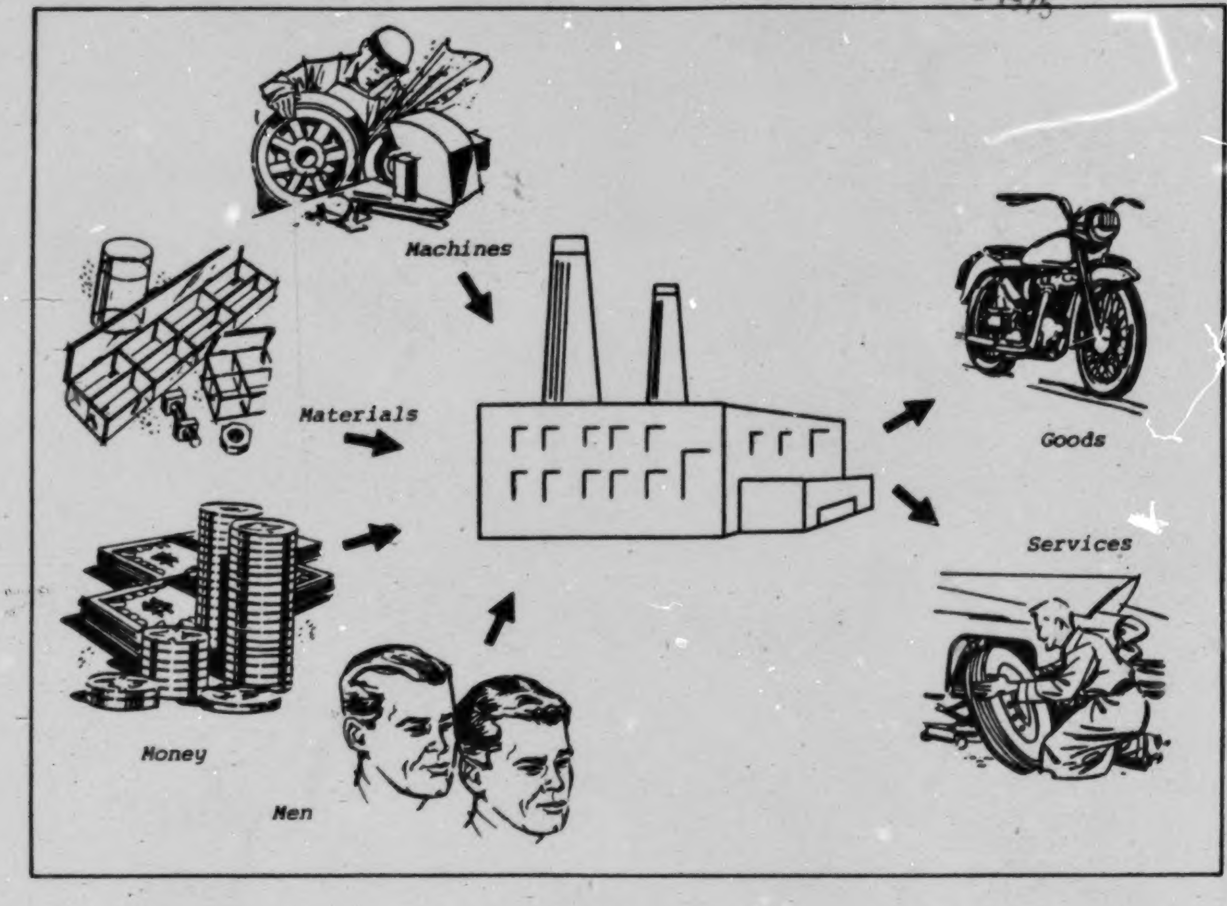
What will be required of you as a co-op student?

What can you expect from your employer regarding working conditions and privileges?

What can you expect from your cooperative education instructor, in and out of class?

AUTOMOTIVE SUSPENSION, STEERING AND BRAKING SYSTEMS

JUL 25 1975


Machines
Materials
Money
Men
Goods
Services

Prepared as an Aid in Implementing
The Wisconsin Guide to Local Curriculum
Improvement in Industrial Education, K-12

A Proposed Curriculum

Prepared as an Aid in Implementing
The Wisconsin Guide to Local Curriculum
Improvement in Industrial Education, K-12

Automotive Suspension,
Steering, and Braking Systems

Capstone Level

Produced by

The Industrial Education Instructional
Materials Development Project
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Dave Bergstrand

Supported by:

The Wisconsin Department of Public Instruction;
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University of Wisconsin-Stout

Sources

1. Program Rationale: The Wisconsin Guide to Local Curriculum Improvement in Industrial Education, K-12.

2. Program Objectives: The American Vocational Association Guide.

3. Source of the Body Content: The automotive industry.

4. Structuring Content: ERIC A.I.M. Volume 5-3 page 231, A Course of Study for Vocational Automotive Mechanics.

5. Student Populations to be Served: Levels 11-12 and adult, mostly male.

6. Program Scope and Sequence: A one semester course which is part of a four semester automotive mechanics training program.

7. Course to be Developed: Automotive Suspension, Steering and Braking Systems.

A comprehensive study of various automobile suspension systems including front end alignment, steering systems and braking systems.

RATIONALE:

Technological advances are being made rapidly in the automotive industry. Today's automobiles are complex machines that require full understanding to be properly maintained.

In order to have a full understanding of the automobile, in-depth study of all major components is necessary. A vocational auto mechanics course should be comprehensive training in which future automotive technicians receive this in-depth instruction about major components. This course of study involves the suspension, steering and braking systems of the automobile, which are indeed major components worthy of in-depth study.

Mission Statement

Orientation and Location: This course is part of the offerings for a two year automotive mechanic training program in a Wisconsin vocational school which is part of the Wisconsin Vocational, Technical and Adult Education System.

Who is to be Prepared? Men and women who meet the entry requirements set forth by the local vocational school. (See characteristics of students for whom the course is intended for a more complete statement.)

To do what?

The student must:

1. Identify and explain the various types of suspension, steering and braking systems used in post 1960 U.S. made automobiles.
2. Employ the proper methods of removal and replacement of selected suspension and steering components.
3. Explain the principles of front end geometry.
4. Properly perform a complete front end alignment on a minimum of eight automobiles of different makes, using all the various alignment apparatus available.
5. Properly balance a minimum of four sets of wheels statically and dynamically using on-the-car and off-the car wheel balancers.
6. Properly explain the principle of operation and correctly overhaul a power steering gear and pump, a power brake unit, a master cylinder, and a wheel cylinder.

7. Properly set up and operate a brake drum and rotor lathe.
8. Properly complete a major brake system, overhaul on a drum brake system and a disc brake system.
9. Practice appropriate work habits and shop safety rules.

To What Level of Qualification? Each course objective will be completed at the time set forth by the instructor. Each course objective will meet the standards set forth by the instructor and for the automotive industry.

Where? As a regular course offering at a Wisconsin vocational school.

Under What Conditions? The instruction will be conducted and organized on a semester basis consisting of 252 class hours of instruction and activity.

Course Objective? To prepare the student for entry into appropriate automotive mechanic occupations and develop a base for further occupational education.

Characteristics of Students for Whom the Course is Intended

1. Student Expectations: Students will expect to thoroughly learn the principles of front end alignment. Included will be: how to align the front end of a car, how to remove and replace various suspension and steering system components, how to overhaul a power steering gear and pump, how to overhaul a power brake unit, how to balance wheels and how to perform a complete brake system overhaul.
2. Student Educational Level: Each student will have successfully completed his tenth grade of education or equivalent there of.
3. Discipline Preparation: Emphasis is placed on the student's interest and aptitude in the automotive mechanics trade.
4. Work Experience: No previous work experience in the automotive field is necessary, however some may have experience.
5. Age: Ordinarily 16-18 years of age and up.
6. Sex: Both men and women, but mostly men.
7. Geographic Origin: Most students will reside in Wisconsin's VTAE Districts.

Task Analysis

TASK: Remove and replace worn, damaged, or broken suspension and steering system components.

SUBTASKS:

Inspects the various components for wear or damage following auto manufacturer's specifications.

Selects proper tools and equipment to remove and replace the components found to be worn, damaged or broken.

Follows auto manufacturer's instructions for removal and replacement of the components found to be worn, damaged or broken.

TASK: Overhaul major steering system components.

SUBTASKS:

Diagnoses problem prior to overhauling the component.

Selects special tools required to overhaul each component.

Follows auto manufacturer's instructions and specifications in overhauling each component.

TASK: Perform complete front end alignment.

SUBTASKS:

Inspects front suspension and steering system components for wear or damage.

Checks tire pressure.

Mounts caster-camber gauges.

Reads and records caster, camber, steering axis inclination, and turning radius.

Adjusts caster and camber to auto manufacturer's specifications.

Mounts toe-in gauge.

Adjusts toe-in to auto manufacturer's specifications and centers steering wheel.

Checks for a toe change condition.

Road tests automobile for handling characteristics.

TASK: Balance wheels.

SUBTASKS:

Balances wheels statically and dynamically.

Balances wheels on the car and off the car.

TASK: Overhaul complete braking system.

SUBTASKS:

Overhauls master cylinder.

Overhauls each wheel cylinder.

Overhauls disc brake caliper assembly.

Resurfaces brake drums and rotors.

Arcs the brake shoes to fit drum.

Packs the front wheel bearings.

Adjusts brakes and emergency brake cable.

Bleeds the air from the braking system at each wheel.

TASK: Practice good work habits.

SUBTASKS:

Practice good safety habits.

Uses hand tools and equipment properly.

Performs work in a craftsman-like manner.

Works well with other people.

Post Instructional Objectives

After successfully completing this course of study, the student will be able to:

1. Identify, using proper terminology, each component of the front suspension system.
2. Explain the function of each component of the front suspension system.
3. Inspect and locate any worn, damaged, or broken components of the front suspension system following auto manufacturer's recommended procedure.
4. Identify, using proper terminology, each component of the steering system.
5. Explain the function of each component of the steering system.
6. Inspect and locate any worn, damaged, or broken components of steering system.
7. Remove and replace any suspension system component using proper tools and equipment following auto manufacturer's recommended procedure.
8. Remove and replace any steering system component using proper tools and equipment following auto manufacturer's recommended procedure.
9. Explain, in detail, the principle of operation of a power steering system.
10. Diagnose correctly a malfunctioning power steering system isolating the component or components causing the malfunction.
11. Overhaul a power steering gear following auto manufacturer's recommended procedure.
12. Overhaul a power steering pump following auto manufacturer's recommended procedure.
13. Define the front suspension angles - camber, caster, steering axis inclination, turning radius, and toe-in.
14. Explain the function of each of the front suspension angles - camber, caster, steering axis inclination, turning radius, and toe-in.
15. Distinguish between the various types of front end alignment adjustments used on American made cars.
16. Perform a complete front end alignment on any American made car making all adjustments to auto manufacturer's spedifications.

17. Use the front end alignment equipment manufactured by BEAR, BEELINE, JOHN BEAN, and SNAP ON, following the equipment manufacturer's recommended procedure.

18. Define static and dynamic wheel balance and the differences between the two.

19. Balance wheels correctly statically and dynamically using on-the-car and off-the-car wheel balancers.

20. Identify, using proper terminology, each component of the braking system.

21. Explain, in detail, the principle of operation of a conventional drum braking system.

22. Explain, in detail, the principle of operation of a disc braking system.

23. Explain, in detail, the principle of operation of a power brake unit.

24. Diagnose correctly a malfunctioning braking system isolating the component or components causing the malfunction.

25. Overhaul a complete braking system properly servicing each component in the hydraulic circuit.

26. Overhaul a power brake unit following auto manufacturer's recommended procedure.

27. Operate a brake drum and rotor lathe properly resurfacing brake drums, rotors, and arcing brake shoes.

28. Repack front wheel bearings and adjust to auto manufacturer's specifications.

29. Practice appropriate safety habits in an automotive repair facility.

30. Use hand tools and equipment in a proper and efficient manner.

31. Organize steps to be taken prior to beginning the repair job.

32. Manage time wisely while doing the repair job.

33. Accept responsibility for doing the complete repair job in a correct and efficient manner.

34. Display pride in the work performed.

35. Assist others when asked for help in solving a problem, doing a task, solving a problem, or answering a question.

Units of Instruction

This course of instruction will consist of an introduction to the course, followed by three units of instruction.

The course introduction will be approximately two class sessions in length and will cover the following areas:

1. Content of the course
2. Equipment that will be used
3. Shop policies
    a. safety rules
    b. tools
    c. work habits
    d. clean-up and maintenance

Unit I will be approximately eight weeks in length and will cover the following areas:

1. Principles of front end alignment
2. Aligning front ends of various makes of automobiles
3. Wheel balancing
4. Removal and replacement of suspension system components

Unit II will be approximately four weeks in length and will cover the following areas:

1. Steering system principles
2. Overhaul of manual and power steering gears and power steering pumps.
3. Removal and replacement of steering system components.

Unit III will be approximately six weeks in length and will cover the following areas:

1. Brake system principles
2. Operation of brake drum and rotor lathe
3. Overhaul of power brake units
4. Overhaul of entire braking system both drum and disc types

En-Route Objectives:

1. The student will correctly identify each component of the front suspension system using proper terminology, either orally or in writing.

2. The student will correctly and thoroughly explain the function of each component of the front suspension system, either orally or in writing.

Learning Activities:

1. Listen to lecture by instructor.
2. View slide series.
3. Read assigned portions of text.
4. Observe demonstrations by instructor.
5. Practice using automobiles available in the shop.

Teacher Activities:

1. Prepare lecture and slide series for presentation.
2. Determine the assigned readings.
3. Prepare demonstrations.
4. Supervise and help students while working in the shop.

Evaluation Plan:

Instructor's evaluation of an oral presentation by each student on an individual basis or a written examination given to each student.

En-Route Objectives:

3. Given an automobile with faulty front suspension system components, the student will inspect the suspension system and locate the faulty components following correct prodedure.

4. Given an automobile with faulty front suspension system components, the student will properly remove and replace the faulty components following auto manufacturer's recommended procedure.

Learning Activities:

1. Observe demonstrations by instructor.
2. Read related sections of the auto service and repair manual.
3. Work with training aid components.
4. Practice using automobiles available in the shop.
5. Work in small groups on automobile with actual problem.

Teacher Activities:

1. Prepare demonstrations.
2. Have sufficient number of training aid components ready.
3. Have sufficient number of automobiles ready.
4. Supervise and help students while working in the shop.

Evaluation Plan:

Instructor's evaluation of procedures followed to complete the objective.

En-Route Objectives:

5. The student will correctly identify each component of the steering system using proper terminology, either orally or in writing.

6. The student will correctly and thoroughly explain the function of each component of the steering system either orally or in writing.

Learning Activities:

1. Listen to lecture by instructor.
2. View slide series.
3. Read assigned portions of text.
4. Observe demonstrations by instructor.
5. Work in small groups with training aid components.
6. Practice using automobiles available in shop.

Teacher Activities:

1. Prepare lecture and slide series for presentation.
2. Determine the assigned readings.
3. Prepare demonstration.
4. Have sufficient number of training aid components ready.
5. Have sufficient number of automobiles ready.
6. Supervise and help students while working in the shop.

Evaluation Plan:

Instructor's evaluation of an oral presentation by each student on an individual basis or a written examination given to each student.

En-Route Objectives:

7. Given an automobile with faulty steering system components, the student will inspect the steering system and locate the faulty components following correct procedure.

8. Given an automobile with faulty steering system components, the student will properly remove and replace the faulty components following auto manufacturer's recommended procedure.

Learning Activities:

1. Observe demonstrations by instructor.
2. Read related sections of the auto service and repair manual.
3. Work with training aid components.
4. Practice using automobiles available in the shop.
5. Work in small groups on automobiles with actual problems.

Teacher Activities:

1. Prepare demonstrations.
2. Have sufficient number of training aid components ready.
3. Have sufficient number of automobiles ready.
4. Supervise and help students while working in the shop.

Evaluation Plan:

Instructor's evaluation of procedures followed to complete the objectives.

En-Route Objectives:

9. The student will correctly and thoroughly explain the principle of operation of a power steering system, either orally or in writing.

10. Given a malfunctioning power steering system, the student will correctly diagnose the malfunction isolating the component or components at fault.

Learning Activities:

1. Listen to lecture by instructor.
2. Read assigned portions of text.
3. Observe demonstrations by instructor.
4. Practice using automobiles available in shop.

Teacher Activities:

1. Prepare lecture.
2. Determine assigned readings.
3. Have sufficient number of automobiles ready.
4. Supervise and help students while working in the shop.

Evaluation Plan:

Instructor's evaluation of an oral presentation by each student on an individual basis or a written examination given to each student as well as the procedures followed and the outcome of the diagnosis.

En-Route Objectives:

11. Given a power steering gear, the student will properly disassemble the gear, identify the internal parts and explain their function, reassemble the gear following auto manufacturer's recommended procedure.

12. Given a power steering pump, the student will properly disassemble the pump, identify the internal parts and explain their function, reassemble the pump following auto manufacturer's recommended prodedure.

Learning activities:

1. Observe demonstrations by instructor.
2. Read related sections in auto service and repair manual.
3. Practice using power steering gears and pumps available in shop.

Teacher Activities:

1. Prepare demonstrations.
2. Have sufficient power steering gears and pumps ready.
3. Supervise and help students while working inthe shop.

Evaluation Plan:

Instructor's evaluation explanation and procedures followed to complete objectives.

En-Route Objectives:

13. The student will correctly define the front suspension angles - camber, caster, steering axis inclination, turning radius, and toe-in, either orally or in writing.

14. The student will correctly and thoroughly explain the function of the front suspension angles camber, caster, steering axis inclination, turning radius, and toe-in, either orally or in writing.

Learning Activities:

1. Listen to lecture by instructor.
2. View slide series.
3. Read assigned portions of text.
4. Sketch the angles.

Teacher Activities:

1. Prepare lecture and slide series for presentation.
2. Determine assigned readings.
3. Aid students in sketching the angles.
4. Prepare instructional handouts.

Evaluation Plan:

Instructor's evaluation of an oral presentation by each student on an individual basis or a written examination given to each student.

En-Route Objectives:

15. Given five different American made automobiles, the student will correctly identify the type of front end alignment adjustments used in each.

16. The student will correctly perform a complete front end alignment on a minimum of eight American made automobiles using each of the front end alignment apparatus available in the shop. Each alignment will be within auto manufacturer's specifications.

Learning Activities:

1. Listen to lecture by instructor.
2. Observe demonstrations by instructor.
3. Read assigned portions of text.
4. Read specification charts.
5. Practice on automobiles coming into shop.

Teacher Activities:

1. Prepare lecture.
2. Prepare demonstrations.
3. Determine assigned readings.
4. Have sufficient number of automobiles ready.
5. Supervise and help students while working in the shop.

Evaluation Plan:

Instructor's evaluation of student's oral identification of adjustments and properly completed front end alignments.

En-Route Objectives:

17. The student will correctly define static and dynamic wheel balance and their differences, either orally or in writing.

18. The student will correctly balance four sets of wheels statically and dynamically using both on-the-car and off-the-car wheel balances.

Learning Activities:

1. Listen to lecture by instructor.
2. Read assigned portions of text.
3. Observe demonstrations by instructor.
4. Practice using automobiles available in the shop.

Teacher Activities:

1. Prepare lecture.
2. Prepare demonstrations.
3. Determine assigned readings
4. Have sufficient number of automobiles ready.
5. Supervise and help students while working in the shop.

Evaluation Plan:

Instructor's evaluation of an oral presentation by each student on an individual basis or a written examination given to each student as well as procedures followed and outcome of wheel balances.

En-Route Objectives:

19. The student will correctly identify each component of the braking system using proper terminology, either orally or in writing.

20. The student will correctly and thoroughly explain the function of each component of the braking system, either orally or in writing.

21. The student will correctly and thoroughly explain the principle of operation of a conventional drum braking system, either orally or in writing.

22. The student will correctly and thoroughly explain the principle of operation of a disc braking system, either orally or in writing.

Learning Activities:

1. Listen to lecture by instructor.
2. Read assigned portions of text.
3. View slide series.
4. Observe demonstrations by instructor.
5. Sketch each system.

Teacher Activities:

1. Prepare lecture and slide series for presentation.
2. Determine assigned readings.
3. Prepare demonstrations.
4. Aid students in sketching systems.

Evaluation Plan:

Instructor's evaluation of an oral presentation by each student on an individual basis or a written examination given to each student.

En-Route Objectives:

23. The student will correctly and thoroughly explain the principle of operation of a power brake unit, either orally or in writing.

26. Given a power brake unit, the student will disassemble, correctly identify and explain the function of each internal part, reassemble following manufacturer's recommended procedure.

Learning Activities:

1. Listen to lecture by instructor.
2. Read assigned portion of text.
3. Observe demonstrations by instructor.
4. View slide series.
5. Read related section of auto service and repair manual.
6. Practice using power brake units available in the shop.

Teacher Activities:

1. Prepare lecture and slide series for presentation.
2. Determine assigned readings.
3. Prepare demonstrations.
4. Have sufficient power brake units ready.
5. Supervise and help students while working in the shop.

Evaluation Plan:

Instructors evaluation of an oral presentation by each student on an individual basis or a written examination give each student as well as the explanation and procedure followed to complete the objectives.

En-Route Objectives:

24. Given a malfunctioning braking system, the student will correctly diagnose the malfunction isolating the component or components at fault.

25. The student will overhaul a minimum of two complete braking systems, properly servicing each component in the hydraulic circuit, resurfacing drums and discs, arcing shoes, repacking wheel bearings, bleeding the system, and adjusting shoes.

Learning Activities:

1. Listen to lecture by instructor.
2. Observe demonstrations by instructor.
3. Practice in small groups assigned to automobile available in the shop.
4. Practice resurfacing drums and discs available in the shop.
5. Overhaul braking systems on cars coming into the shop.

Teacher Activities:

1. Prepare lecture.
2. Prepare demonstrations.
3. Have sufficient practice materials ready.
4. Have sufficient number of automobiles ready.
5. Supervise and help students while working in the shop.

Evaluation Plan:

Instructor's evaluation of procedures followed to accomplish the objective and the final outcome.

En-Route Objectives:

27. The student will observe the shop safety rules at all times without exception while in the auto shop.

28. Given hand tools and equipment, the student will demonstrate the proper use of each at all times.

29. Given an assigned task, the student will organize the steps he will take to complete the task prior to beginning the task orally to the instructor.

Learning Activities:

1. Listen to lecture by instructor.
2. Listen to lecture by speaker.
3. View film on safety.
4. View slide series on use of hand tools.

Teacher Activities:

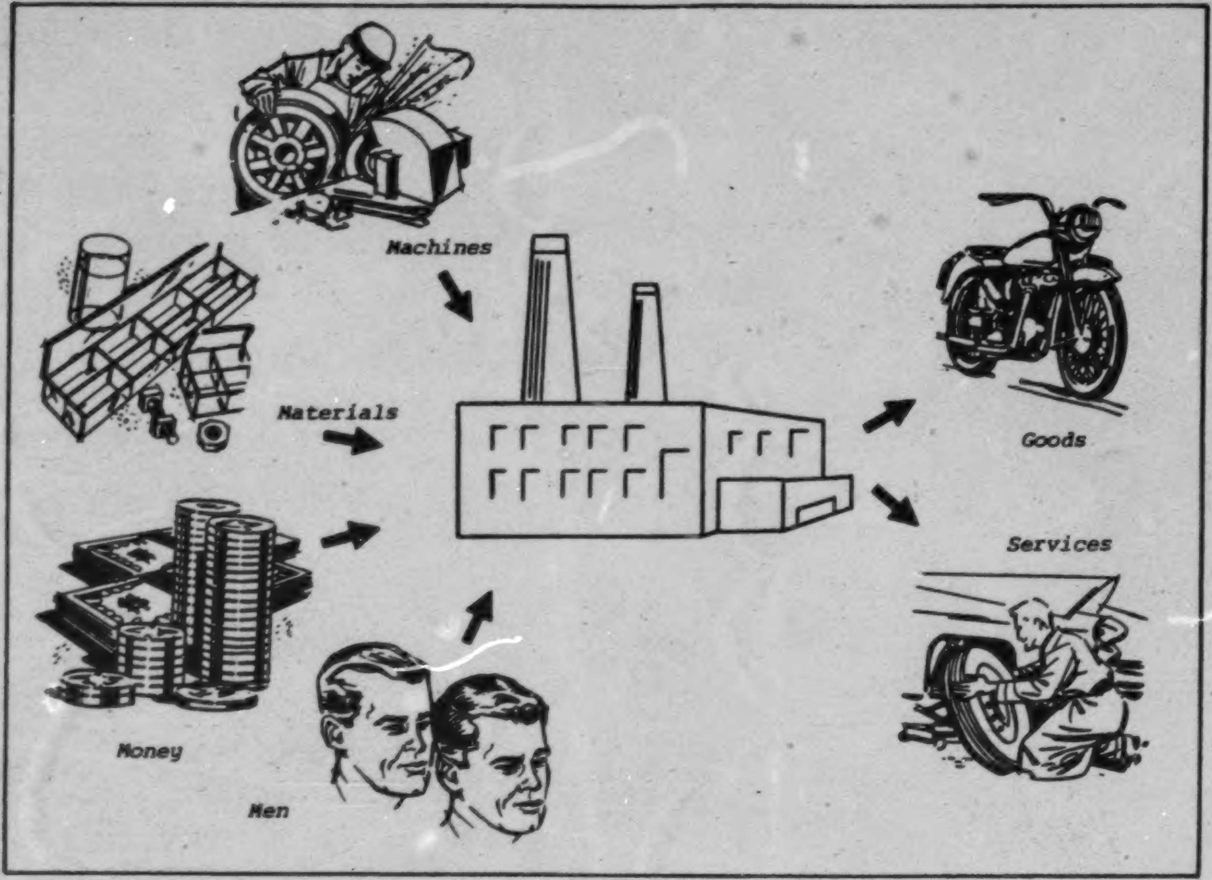
1. Prepare lecture.
2. Prepare for outside speaker.
3. Prepare film and slide series.
4. Observe students while working.

Evaluation Plan:

Instructor's evaluation of each student after close observation while working in the shop.

CLEANING AND LUBRICATION OF ELECTRIC MOTORS

JUL 25 1975


Machines
Materials
Goods
Services
Money
Men

Prepared as an Aid in Implementing
The Wisconsin Guide to Local Curriculum
Improvement in Industrial Education, K-12

Activity Package

Prepared as an Aid in Implementing
The Wisconsin Guide to Local Curriculum
Improvement in Industrial Education, K-12

This package applies to the following industrial element:

Maintenance and Services

The Cleaning and Lubrication of Electric Motors

Senior High School

Pertaining to Field Objective Number One

"To work with the element of industry
to gain an understanding of how they
function in producing goods and services"

Produced by

The Industrial Education Instructional
Materials Development Project
University of Wisconsin-Stout
Menomonie, Wisconsin

Project Director:

Lawrence S. Wright, Ed.D.

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Contributor to this Package:

Thomas Burt

Supported by:

The Wisconsin Department of Public Instruction;
The Graduate College and the Center for Vocational,
Technical and Adult Education, both of the
University of Wisconsin-Stout

The Cleaning and Lubrication of Electric Motors

Information:

Regular inspection, cleaning, and lubrication of electric motors is a necessity for trouble-free operation and long life. Dust, oil, moisture, and shock and vibration are the common enemies of motors and can only be minimized by continual attention to maintenance. Neglect of motors can also result in fires and accidents. For example, moisture and dirt on and in a motor can provide a conductive path for electricity and could provide a shock hazard. The collection of dust in and around a motor will restrict the flow of cooling air and also provide an insulation causing the motor to become hot. The temperature could rise to the point of combustion in the dust, thereby causing a fire.

In this package you will inspect, clean and lubricate two electric motors. Since motors vary somewhat in design, your procedure will require the proper allowances.

Tools and Equipment:

1. Wrenches and screwdrivers
2. Several wipe-up rags
3. Compressed air
4. A fairly soft, long bristled brush
5. Solvent
6. Lubricating oil

Procedure:

1. Obtain electric motors.

2. Obtain tools and equipment.

3. If the motor is mounted on a machine and can be conveniently removed, do so, but perform inspection steps A-C first.

4. Inspect the motor:

A. Is the motor firmly attached to its mount?

B. Is there excessive vibration while operating? (If there is no vibration while operating disconnected from the machine, the problem is likely not in the motor.)

C. Is the motor properly aligned with the machine it powers?

D. Is the shaft straight? Are the pulleys in good condition and properly attached?

E. Are there signs of deteriorated seals, such as oil leak?

F. Are there signs of overheating?

5. Clean the motor

A. If the motor has been well maintained in the past, brushing, wiping, and blowing out with compressed air will suffice. Motors which have open air vents on the ends may not even require dismantling.

B. If the dust and dirt is caked onto the motor, remove it with solvent. Remove the ends of the motor to facilitate cleaning.

6. Lubricate the bearings. Lubrication will depend upon the type of bearing.

A. Ball bearing motors.

1. Many small electric motors have sealed ball bearings. These cannot be further lubricated.

2. Most which require lubrication have a lube hole which is sealed with a screw. Squeeze a small amount of lubricant into each bearing.

B. Sleeve type bearing motors.

1. Open oil well type. Apply oil into a hole, usually located above the bearing. Do not over-lubricate! A drop or two is enough. Excess will result in collection of dust with the oil on the outside of the bearing.

2. Loose ring oilers. Oil is usually supplied from a well beneath the bearing by a metal ring which is partially submerged in oil. Be sure the well has a sufficient oil supply.

3. Wick oilers. Apply a few drops of oil to the felt wick which presses against the bearing.

4. Porous bearing. These bearings usually do not require lubrication. A light oil however, can be applied to the felt material found next to the bearing.

7. Reassemble the motors. Remount securely on the machine if it was taken from one.

8. Answer the following questions:

   A. How is each of the motors cooled? What special provisions for cooling did the manufacturer make?

   B. Was the motor designed for ease of maintenance? What changes in design might have made your maintenance task easier?

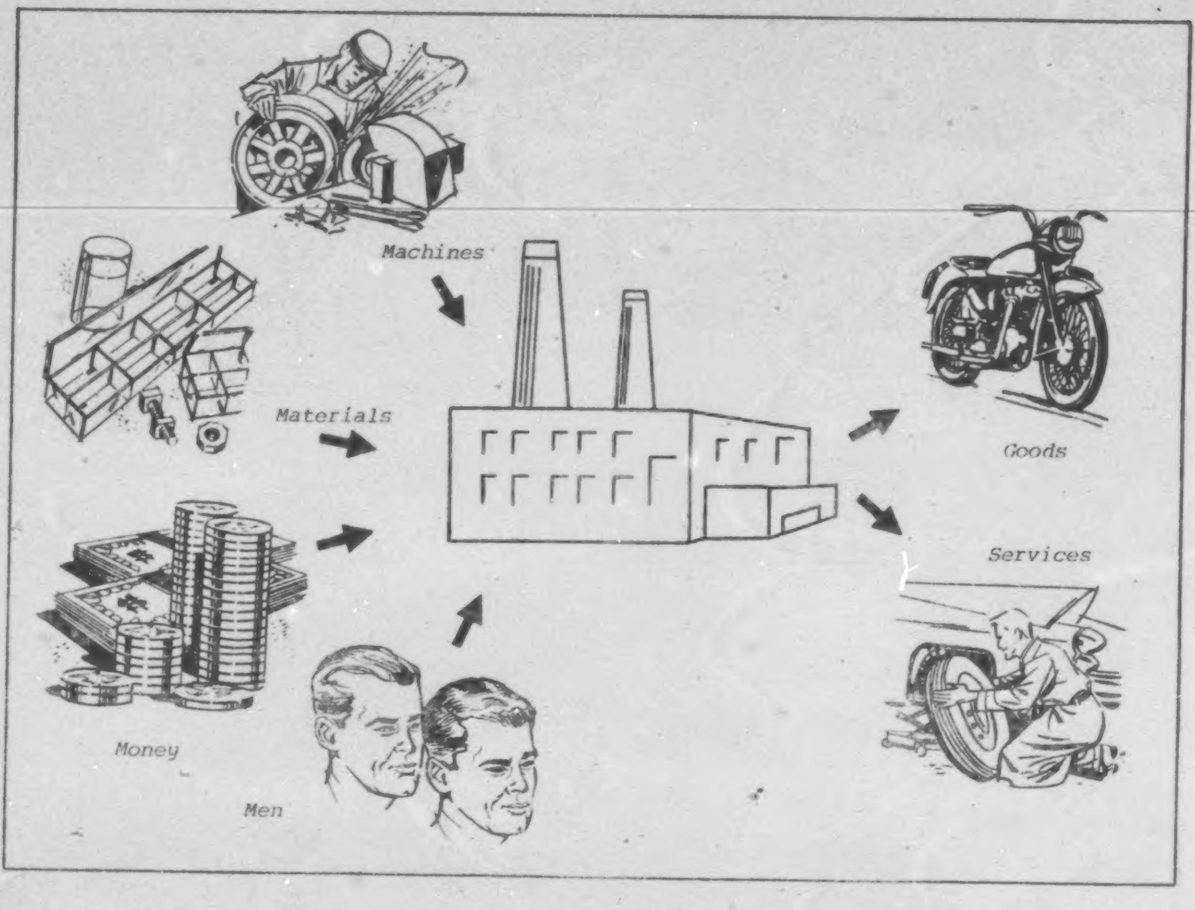
   C. Fire and electrical shock were mentioned as possible accidents caused by electric motors. Can you think of any other hazards a maintenance man should be aware of?

GEOMETRIC

AND POSITIONAL

DIMENSIONING

JUL 25 1975


Machines
Materials
Money
Men
Goods
Services

Prepared as an Aid in Implementing
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Rationale:

This package assumes you have had prior experiences in the communications and production areas, mechanical drafting procedures, and an understanding of dimensioning and tolerancing.

To communicate ideas better, larger companies (aerospace and ground vehicle industries), professional societies, military, and standards agencies of a number of countries, developed a system of dimensioning and tolerancing.

What evolved is an organized system of geometric and positional dimensioning which has become an internationally recognized concept. Geometric and positional dimensioning is becoming the 'spoken word' in industry, the military, and internationally on engineering drawing. A working knowledge of this area is necessary for a competent draftsman.

_____ If you feel you cannot meet the objectives:

- _____ A. Take the self-test to see what objectives you do not fully understand, then turn to the media section on page 7.
- _____ B. Skip the self-test and turn directly to the media section on page 7.

Self-Test: Answer the following questions. You may write in this booklet.

1. Define the following terms:

Basic -

Datum -

Feature -

Reference -

True position -

Maximum material condition -

Regardless of feature size -

2. Sketch the symbols for the following terms:

Flatness

Parallelism

Symmetry

True Position

Runout

Angularity

Straightness

Perpendicularity

Roundness

Concentricity

Contour

Cylindricality

3. What four items may be contained in a feature control symbol?

4. Does a basic dimension have a tolerance?

5. Does the surface irregularity of a datum have any effect on features dimensioned from that datum? Explain.

6. Is a flatness tolerance additive to the size tolerance of parts? Explain.

7. If a roundness requirement is specified, roundness within .020 with the words "on tad.", how wide is the tolerance band?

8. If one diameter is eccentric to another diameter by .001, how much is it concentric?

9. Does a roundness tolerance apply to the cross section perpendicular to the axis, or a cylindrical tolerance zone?

10. Cylindricality tolerance simultaneously controls what three geometric forms?

11. Is parallelism of a surface additive to the overall size dimension of that surface?

12. What shape of tolerance zone does true position diameter create?

13. Does true position also control perpendicularity?

14. What type of tolerance zone is recommended, if the feature to be toleranced is above the surface of the part?

15. If a hole located by a true position diameter departs from its possible maximum material condition, can it be said that this amount of departure may be added to the stated true position?

MEDIA SECTION

Objective Number 1: Explain or define, in your own words, the geometric and positional dimensioning system.

Optional Media: Check one or more.

_____ 1. Read the information in this package on page 10.

_____ 2. Consult any of the references listed on page 32.

When you feel you can meet this objective, complete the activity listed on page 33.

Activity: Geo. and Pos. Dim.-V-1

Objective Number 2: Define the terms: basic, datum, feature, reference, true position, maximum material condition, and regardless of feature size.

Optional Media: Check one or more.

_____ 1. Read the information in this package on pages 11 and 12.

_____ 2. Consult any of the references listed on page 32.

When you feel you can meet this objective, choose one or more of the activity options listed below.

Activity Options: Choose one or more.

_____ 1. Geo. and Pos. Dim.-V-2A

_____ 2. Geo. and Pos. Dim.-V-2B

Objective Number 3: Name the two types of tolerances the geometric and positional dimensioning system is divided into and what they describe.

Optional Media: Check one or more.

_____ 1. Read the information in this package on page 15.

_____ 2. Consult any of the references listed on page 32.

When you feel you can meet this objective, choose one or more of the activity options listed below.

Activity Options: Choose one or more.

_____ 1. Geo. and Pos. Dim.-V-3A

_____ 2. Geo. and Pos. Dim.-V-3B-5B

Objective Number 4: Discuss, either orally or in writing, the advantages and disadvantages of using the geometric and positional dimensioning system.

Optional Media: Check one or more.

_____ 1. Read the information in this package on page 10.

_____ 2. Consult any of the references listed on page 32.

When you feel you can meet this objective, choose one or more of the activity options listed below.

Activity Options: Choose one or more.

_____ 1. Geo. and Pos. Dim.-V-4A

_____ 2. Geo. and Pos. Dim.-V-4B

Objective Number 5: Correctly identify and interpret the meaning of the geometric and positional dimensioning symbols.

Optional Media: Check one or more.

_____ 1. Read the information in this package on pages 13-31.

_____ 2. Consult any of the references listed on page 32.

When you feel you can meet this objective, choose one or more of the activity options listed below.

Activity Options: Choose one or more.

_____ 1. Geo. and Pos. Dim.-V-5A

_____ 2. Geo. and Pos. Dim.-3B-5B

_____ 3. Geo. and Pos. Dim.-V-5C

Objective Number 6: Redimension a drawing you have completed using geometric and positional dimensioning standards to describe the parts.

Optional Media: Check one or more.

_____ 1. Read the information in this package on page 13-31.

_____ 2. Consult any of the references listed on page 32.

When you feel you can meet this objective participate in the activity listed below.

Activity: Geo. and Pos. Dim.-V-6

Objective Number 7: Given a layout drawing, make a set of detail drawings of the product using geometric and positional dimensioning to describe the parts which need to be controlled and how they relate to each other.

Optional Media: Consult one or more.

_____ 1. Read the information in this package on pages 13-31.

_____ 2. Consult any of the references listed on page 32.

When you feel you can meet this objective participate in the activity listed below.

Activity: Geo. and Pos. Dim.-V-7

Objective Number 8: Apply geometric and positional dimensioning controls to any drawing where features need to be controlled.

Optional Media: Consult one or more.

_____ 1. Read the information in this package on page 13-31.

_____ 2. Consult any of the references listed on page 32.

When you feel you can meet this objective participate in the activity listed below.

Activity: Geo. and Pos. Dim.-V-8

INFORMATION SECTION

What is geometric and positional dimensioning?

Geometric and positional dimensioning applies geometric shapes to describe how different features of an object relate to each other. The purpose of this is to bring together the different stages of design, production and assembly operations which are becoming more specialized and unique.

The advantages of geometric and positional dimensioning are many. When used properly they:

1. Describe the actual function of a part.
2. Describe the relationship of mating parts.
3. Provide clarity and preciseness on engineering drawings.
4. Reduce costs by reducing 'bad parts'.
5. Provides better inter-changeability and assembly of parts.

A disadvantage of geometric and positional dimensioning is that cost savings are realized only on high production runs. Thus, geometric and positional dimensioning is not suited for small number, low production items. Another disadvantage comes from a misunderstanding of the concepts. People in the design, production and assembly operations must all have the same understanding of each of the concepts. To assure complete understanding of the concepts, extensive training programs may need to be used.

A presentation of the basic definitions, symbols, notations and concepts follows to familiarize you with this information.

DEFINITIONS

Basic: A dimension labeled basic (a frame ▭ or abbreviated BSC) is a value used to describe the exact size or shape of a feature. The tolerance, or variation of that dimension is specified in a geometric symbol relationship, not in the general (e.g. title block) tolerance.

Datum: Datums are points, lines, planes, cylinders, etc. assumed to be exact for purposes of computation from which the location or geometric relationship of other features of a part may be established. *Selection of the correct datum(s) is important.

Feature: Features are specific characteristics (or component portions) of a part, such as plane surfaces, holes, screw threads, splines, etc. A feature in itself can be a datum for another feature.

Reference: A dimension labeled 'FEF' is for information only. It does not have a specific tolerance and need not be checked.

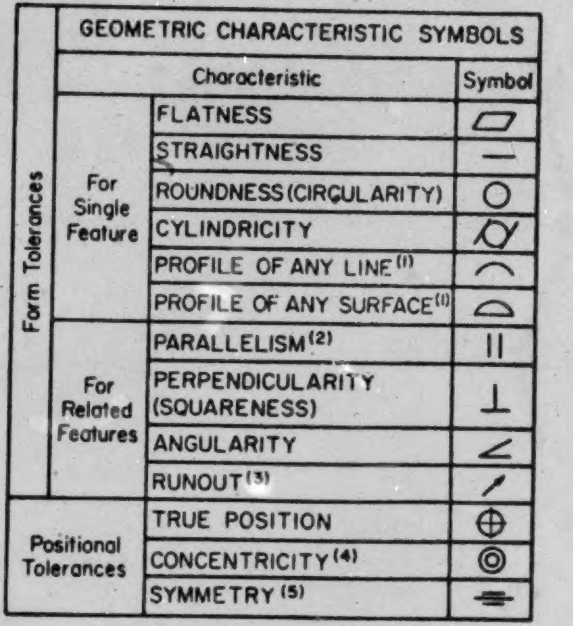
True Position: Is a term used to describe the exact (or perfect) position (or location) of a feature in relation to a datum. The location is theoretical and the given tolerance is measured from this position.

Maximum material condition (MMC) is a condition where the feature contains the maximum amount of material. For example, the maximum material condition of a shaft occurs at its high limit of size and that of a hole at its low limit of size.

Regardless of Feature Size (RFS) the condition where tolerance of position or form must be met irrespective of where the feature lies within its size tolerance.*

* All items marked with an asterisk have been extracted from: USA Standard Drafting Practices, Dimensioning and Tolerancing for Engineering Drawings (USASI Y14.5-1966), with the permission of the publisher, The American Society of Mechanical Engineers, United Engineering Center, 345 E. 47th St., New York, New York 10017.

The symbols denoting geometric characteristics are shown in Figure 1. Notice how the symbol relates to the characteristic.



GEOMETRIC CHARACTERISTIC SYMBOLS			
		Characteristic	Symbol
Form Tolerances	For Single Feature	FLATNESS	▱
		STRAIGHTNESS	—
		ROUNDNESS (CIRCULARITY)	○
		CYLINDRICITY	⌭
		PROFILE OF ANY LINE[1]	⌒
		PROFILE OF ANY SURFACE[1]	⌓
	For Related Features	PARALLELISM[2]	∥
		PERPENDICULARITY (SQUARENESS)	⊥
		ANGULARITY	∠
		RUNOUT[3]	↗
Positional Tolerances		TRUE POSITION	⌖
		CONCENTRICITY[4]	◎
		SYMMETRY[5]	⌯

FIGURE 1*

The datum identifying symbol consists of a frame containing the datum reference letter (Fig. 2).* (See Fig. 5 for example of use)

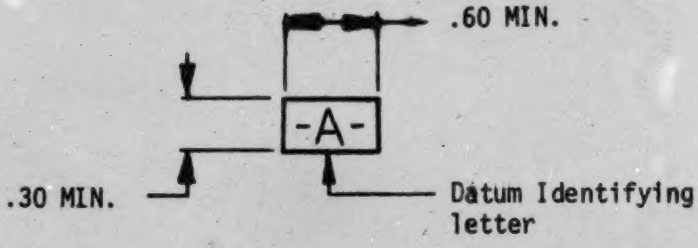


FIGURE 2

The symbolic means of labeling a basic or true position is by enclosing in a frame (Fig. 3) * or listing the abbreviation 'BSC' after the dimension.

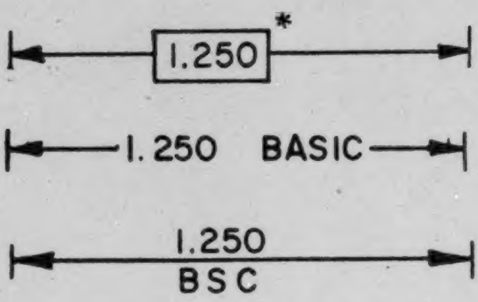


FIGURE 3

Feature control symbols.

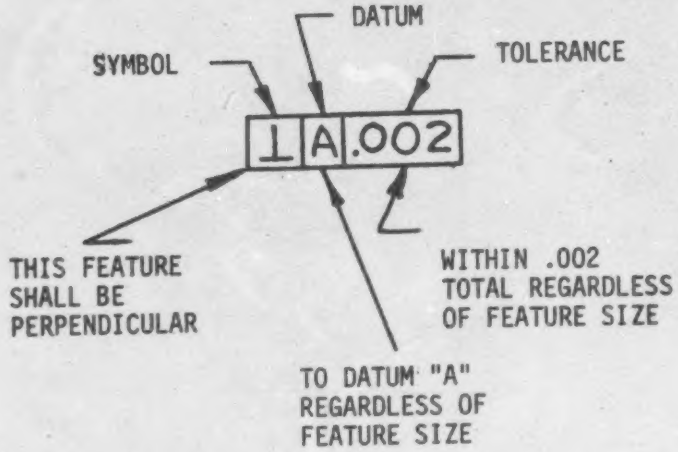

DATUM
SYMBOL
TOLERANCE
⊥ A .002
THIS FEATURE SHALL BE PERPENDICULAR
WITHIN .002 TOTAL REGARDLESS OF FEATURE SIZE
TO DATUM "A" REGARDLESS OF FEATURE SIZE

FIGURE 4*

Note in figure 5 how the feature control symbols are used to describe the features being toleranced.

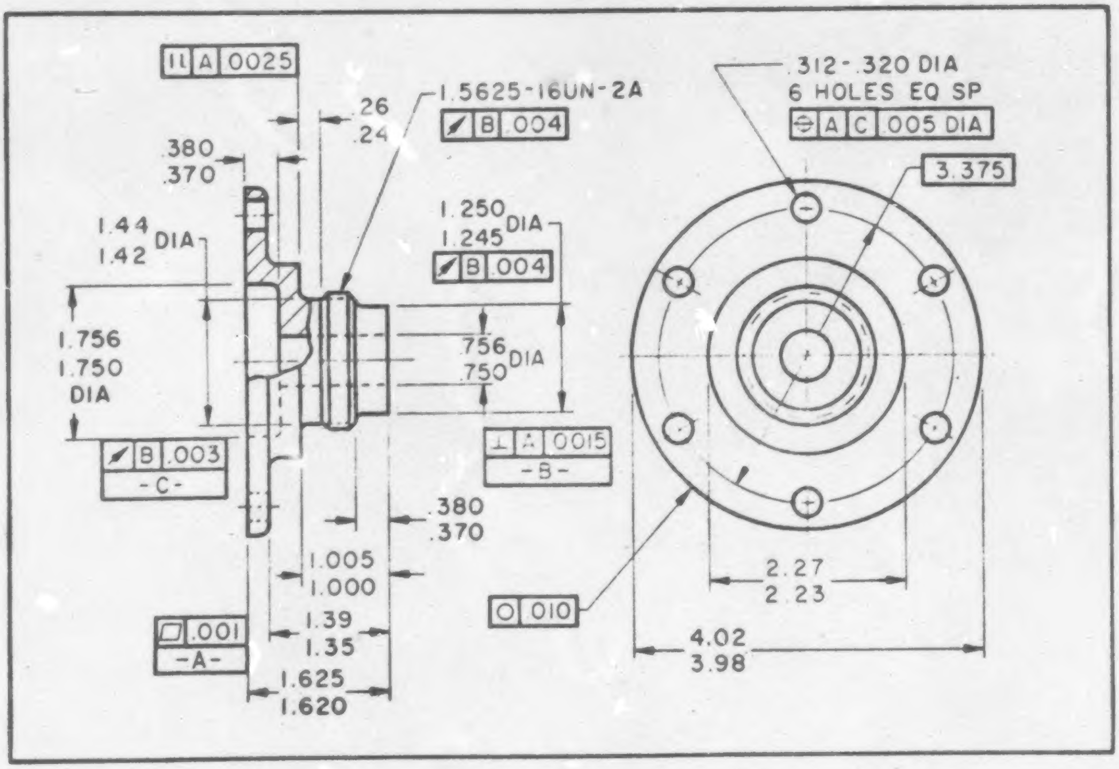

∥ A .0025
.26
.24
1.5625-16UN-2A
↗ B .004
.380
.370
1.44
1.42
DIA
1.250
1.245
DIA
↗ B .004
1.756
1.750
DIA
.756
.750
DIA
↗ B .003
-C-
⊥ A .0015
-B-
.380
.370
1.005
1.000
▱ .001
-A-
1.39
1.35
1.625
1.620
.312-.320 DIA
6 HOLES EQ SP
⌖ A C .005 DIA
3.375
○ .010
2.27
2.23
4.02
3.98

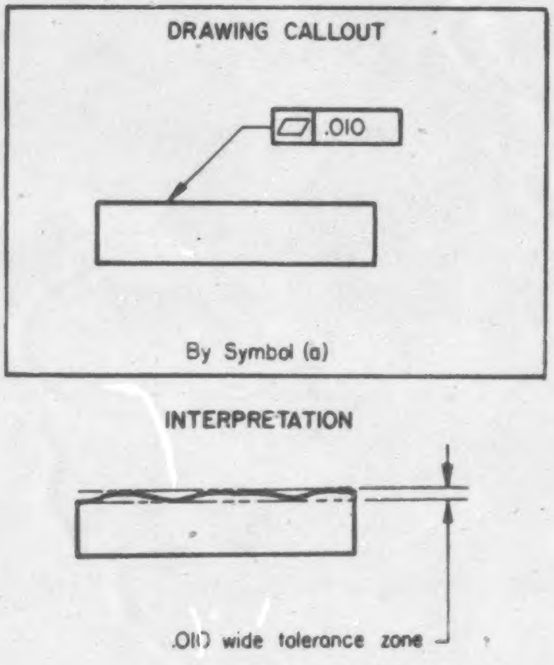
FIGURE 5

Application of Geometric Characteristic Symbols*

The following are examples of how each symbol (from Fig. 1) is used on a drawing and an interpretation of what it means. The symbols are divided into two areas: form tolerancing and position tolerancing.

FORM TOLERANCING

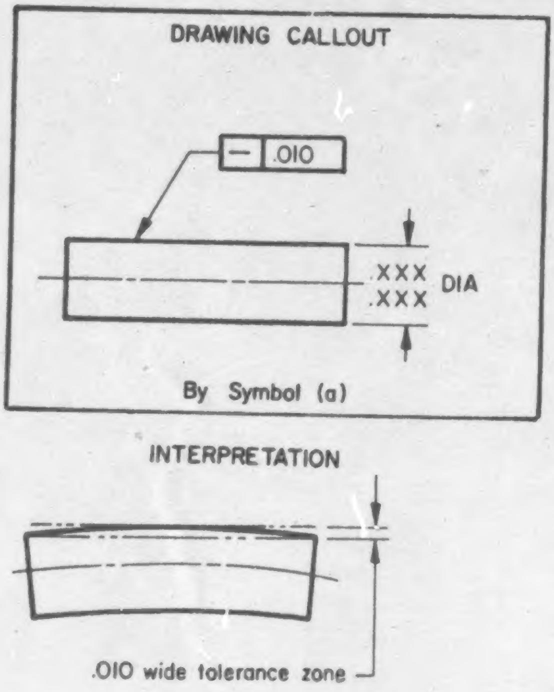
The first group of symbols of form describe how far surfaces or features of a part can vary from the desired (basic) dimension. They show how different features are related to each other.


DRAWING CALLOUT
▱ .010
By Symbol (a)
INTERPRETATION
.010 wide tolerance zone

The surface must be within the specified tolerance of size and must lie between two parallel planes (.010 apart).

FIGURE 6

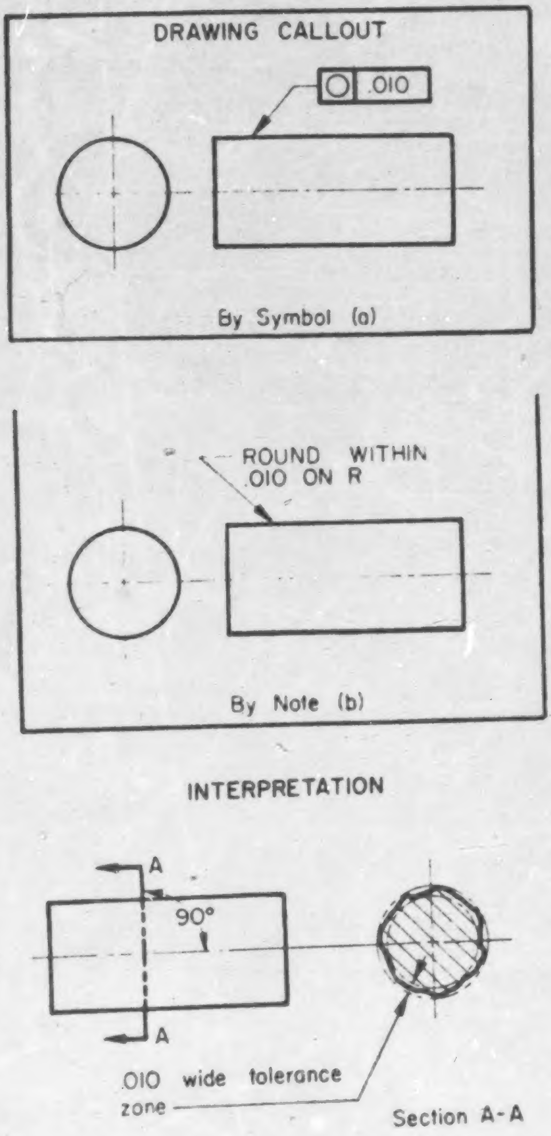
Specifying Flatness*


DRAWING CALLOUT
— .010
.XXX
.XXX
DIA
By Symbol (a)
INTERPRETATION
.010 wide tolerance zone

The feature must be within the specified tolerance of size and any longitudinal element of its surface must lie between two parallel lines (.010 apart) where the two lines and the nominal axis of the feature share a common plane.

FIGURE 7

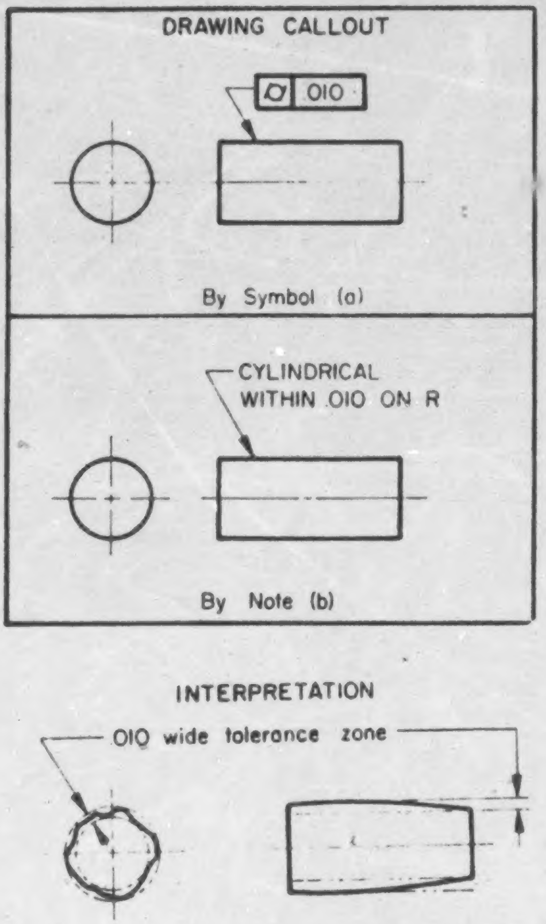
Specifying Straightness*


DRAWING CALLOUT
.010
By Symbol (a)
ROUND WITHIN
.010 ON R
By Note (b)
INTERPRETATION
A
90°
A
.010 wide tolerance
zone
Section A-A

The periphery at any cross section perpendicular to the axis must be within the specified tolerance of size and must lie between two concentric circles (one having a radius .010 larger than the other).

FIGURE 8

Specifying Roundness for a Cylinder*

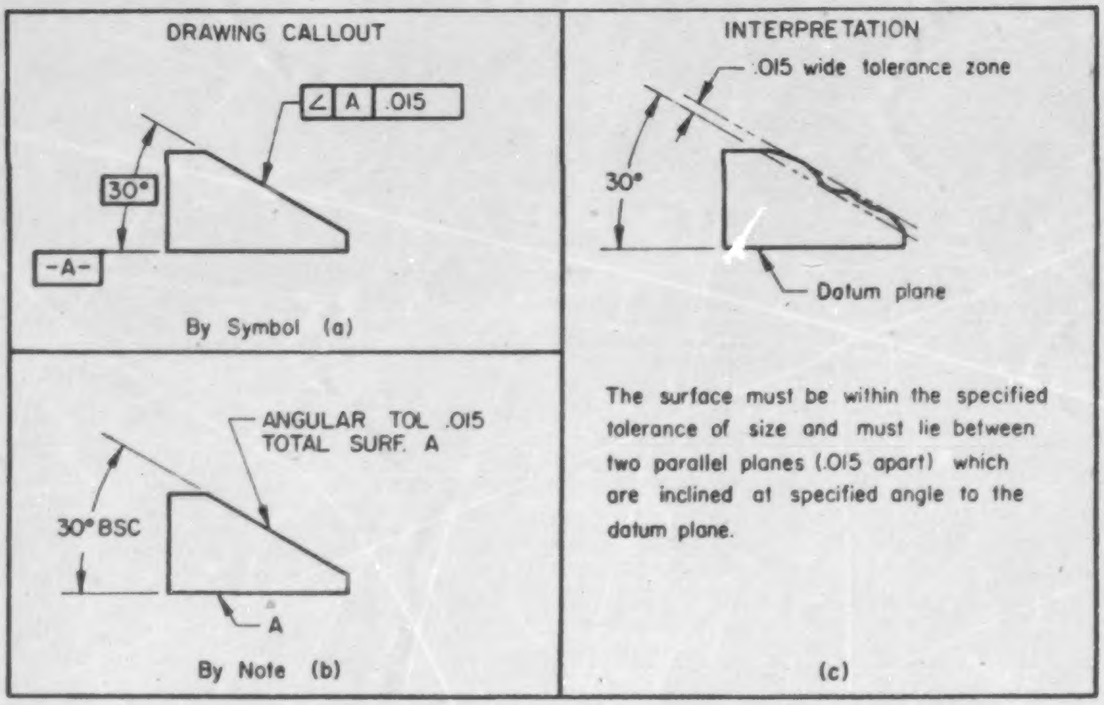

DRAWING CALLOUT
.010
By Symbol (a)
CYLINDRICAL
WITHIN .010 ON R
By Note (b)
INTERPRETATION
.010 wide tolerance zone

The feature must be within the specified tolerance of size and must lie between two concentric cylinders (one having a radius .010 larger than the other).

FIGURE 9

Specifying Cylindricality

Specifying Angularity*


DRAWING CALLOUT
INTERPRETATION
∠ A .015
30°
-A-
By Symbol (a)
.015 wide tolerance zone
30°
Datum plane
ANGULAR TOL .015
TOTAL SURF. A
30° BSC
A
By Note (b)
(c)

The surface must be within the specified tolerance of size and must lie between two parallel planes (.015 apart) which are inclined at specified angle to the datum plane.

FIGURE 12

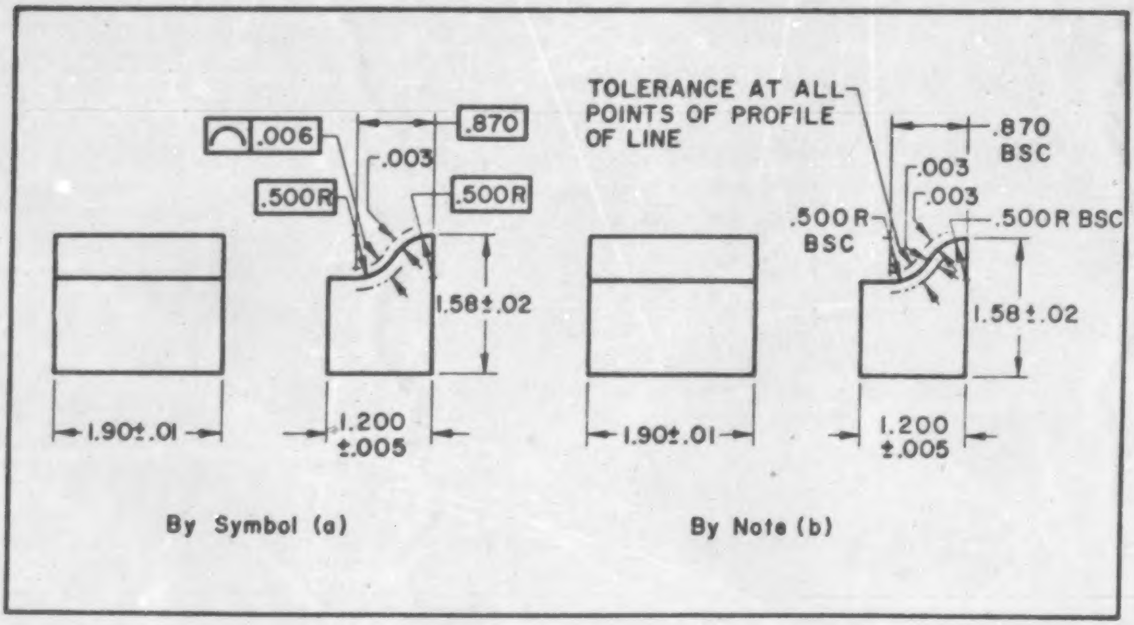

⌒ .006
.870
.003
.500R
.500R
1.58±.02
1.90±.01
1.200
±.005
By Symbol (a)
TOLERANCE AT ALL POINTS OF PROFILE OF LINE
.870
BSC
.003
.003
.500 R
BSC
.500 R BSC
1.58±.02
1.90±.01
1.200
±.005
By Note (b)

FIGURE 13

Specifying Profile of a Line*

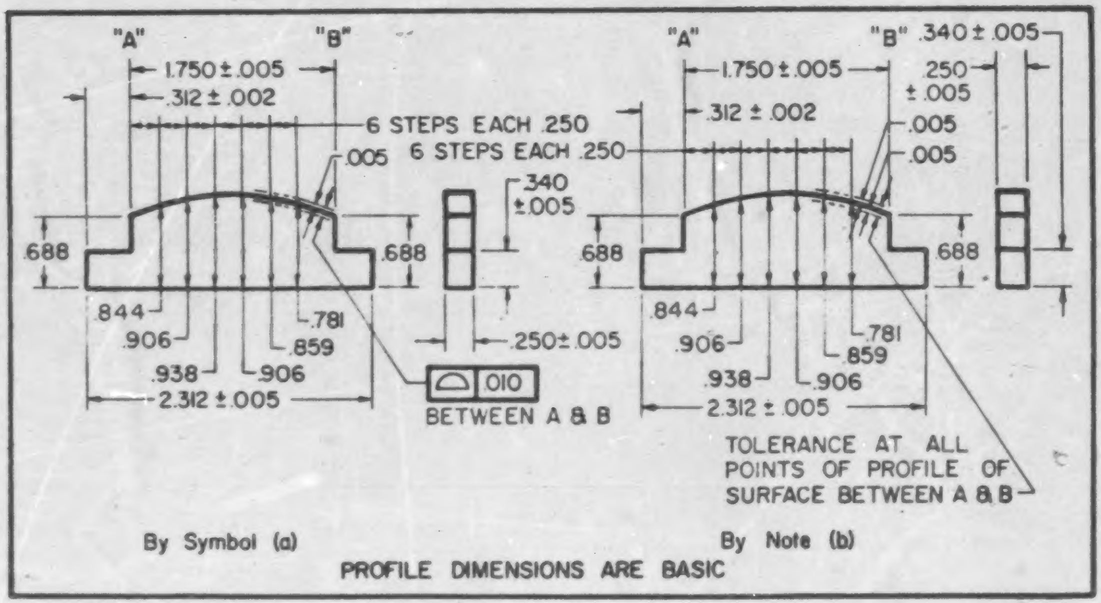

"A"
"B"
1.750 ± .005
.312 ± .002
6 STEPS EACH .250
.005
.340 ±.005
.688
.688
.844
.906
.938
.906
.859
.781
2.312 ± .005
.250± .005
.010
BETWEEN A & B
By Symbol (a)
"A"
"B"
.340 ± .005
1.750 ± .005
.312 ± .002
.250 ± .005
.005
.005
6 STEPS EACH .250
.688
.688
.844
.906
.938
.906
.859
.781
2.312 ± .005
TOLERANCE AT ALL POINTS OF PROFILE OF SURFACE BETWEEN A & B
By Note (b)
PROFILE DIMENSIONS ARE BASIC

FIGURE 10

Specifying Profile of a Surface*

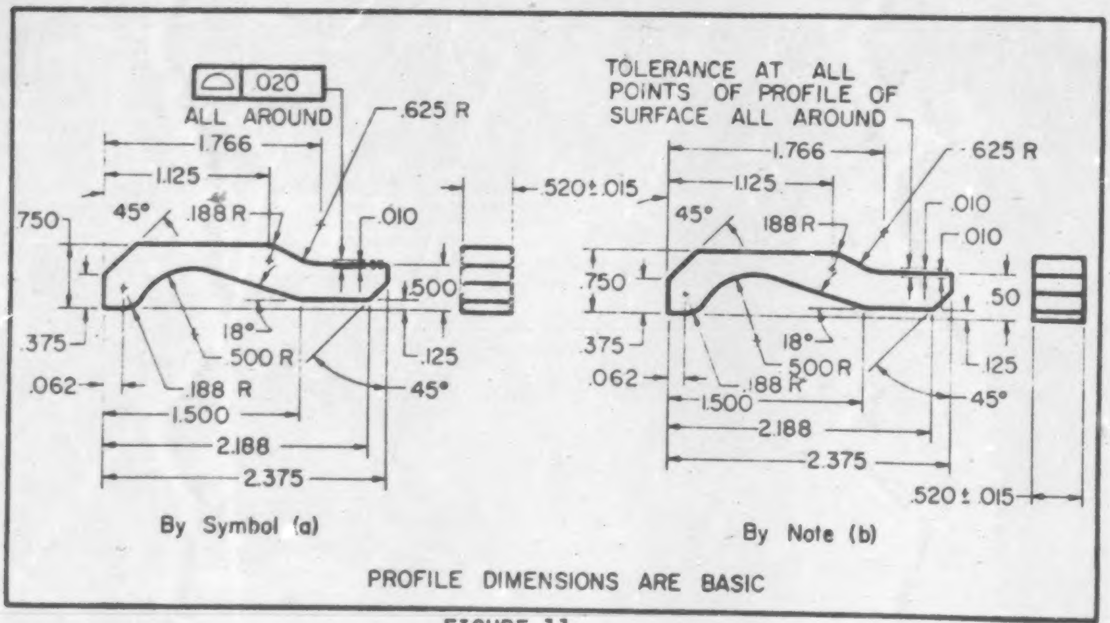

.020
ALL AROUND
.625 R
1.766
1.125
.750
45°
.188 R
.010
.500
.375
18°
.500 R
.125
.062
.188 R
45°
1.500
2.188
2.375
.520± .015
By Symbol (a)
TOLERANCE AT ALL POINTS OF PROFILE OF SURFACE ALL AROUND
.625 R
1.766
1.125
45°
.188 R
.010
.010
.750
.50
.375
18°
.500 R
.125
.062
.188 R
45°
1.500
2.188
2.375
.520 ± .015
By Note (b)
PROFILE DIMENSIONS ARE BASIC

FIGURE 11

Specifying Profile of a Surface*

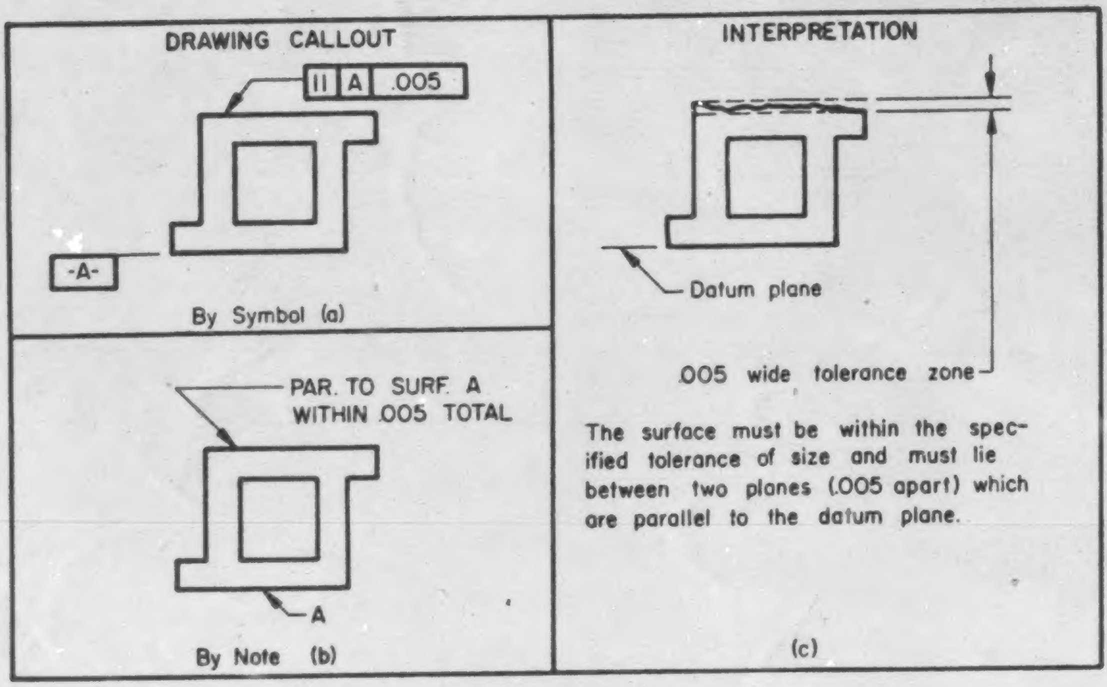

DRAWING CALLOUT
II A .005
-A-
By Symbol (a)
PAR. TO SURF. A
WITHIN .005 TOTAL
A
By Note (b)
INTERPRETATION
Datum plane
.005 wide tolerance zone
The surface must be within the specified tolerance of size and must lie between two planes (.005 apart) which are parallel to the datum plane.
(c)

FIGURE 14

Specifying Parallelism*

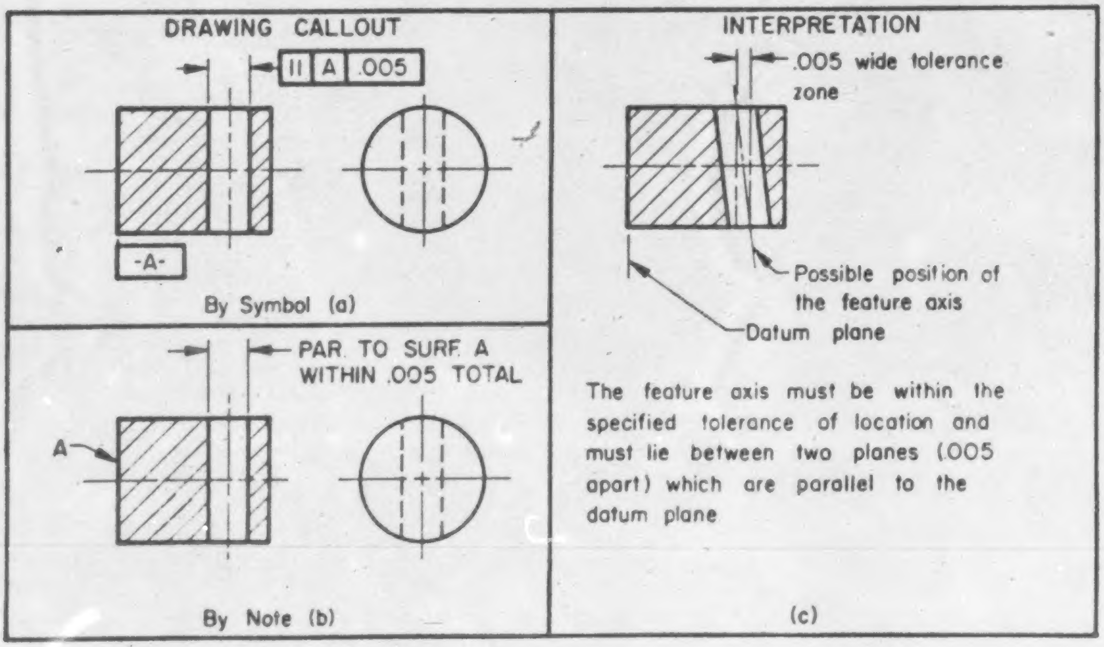
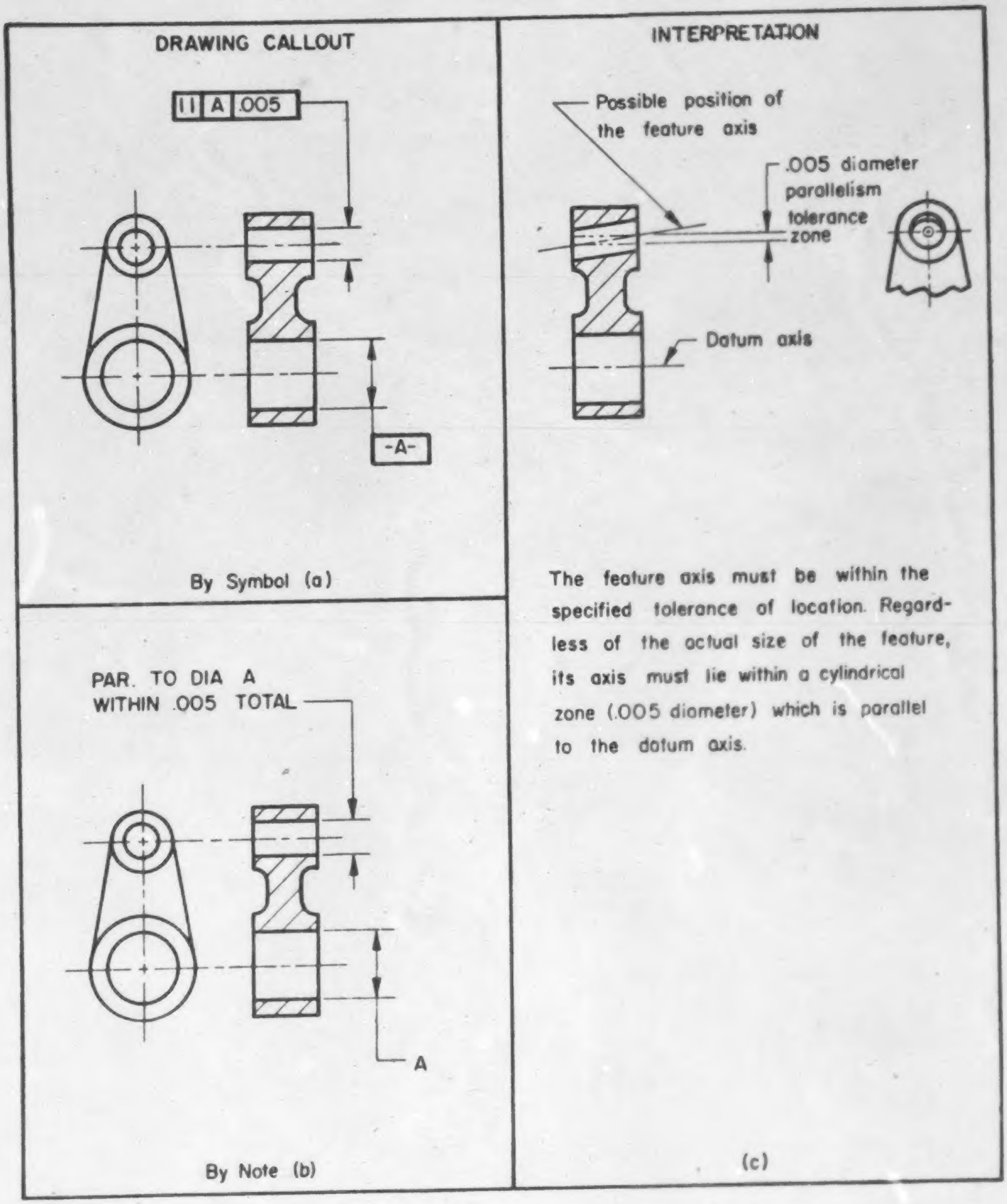

DRAWING CALLOUT
II A .005
-A-
By Symbol (a)
PAR. TO SURF. A
WITHIN .005 TOTAL
A
By Note (b)
INTERPRETATION
.005 wide tolerance zone
Possible position of the feature axis
Datum plane
The feature axis must be within the specified tolerance of location and must lie between two planes (.005 apart) which are parallel to the datum plane
(c)

FIGURE 15

Specifying Parallelism*


DRAWING CALLOUT
INTERPRETATION
∥ A .005
Possible position of the feature axis
.005 diameter parallelism tolerance zone
Datum axis
-A-
PAR. TO DIA A
WITHIN .005 TOTAL
A

By Symbol (a)

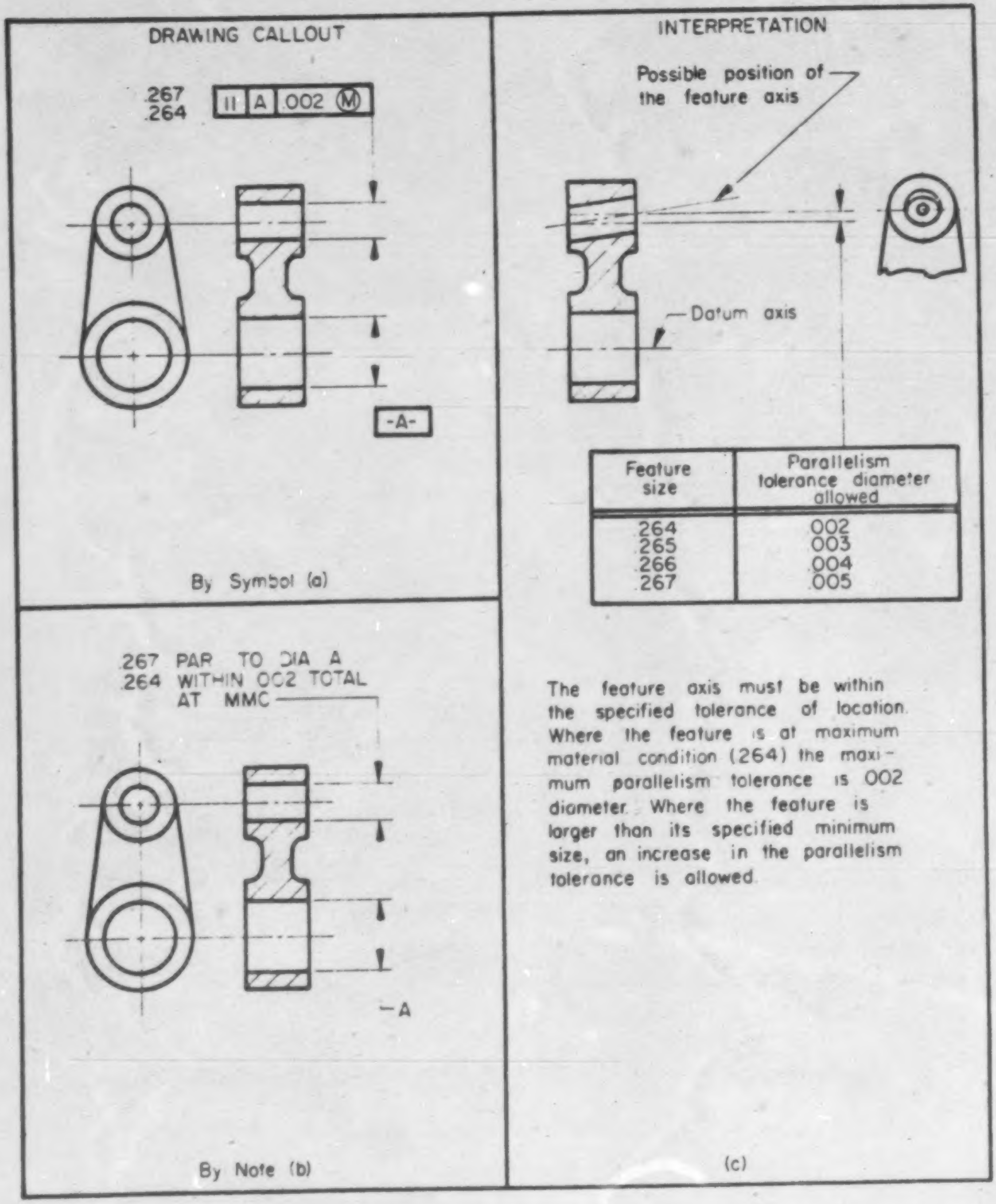
By Note (b)

The feature axis must be within the specified tolerance of location. Regardless of the actual size of the feature, its axis must lie within a cylindrical zone (.005 diameter) which is parallel to the datum axis.

(c)

FIGURE 16

Specifying Parallelism (Feature RFS and Datum feature RFS)*

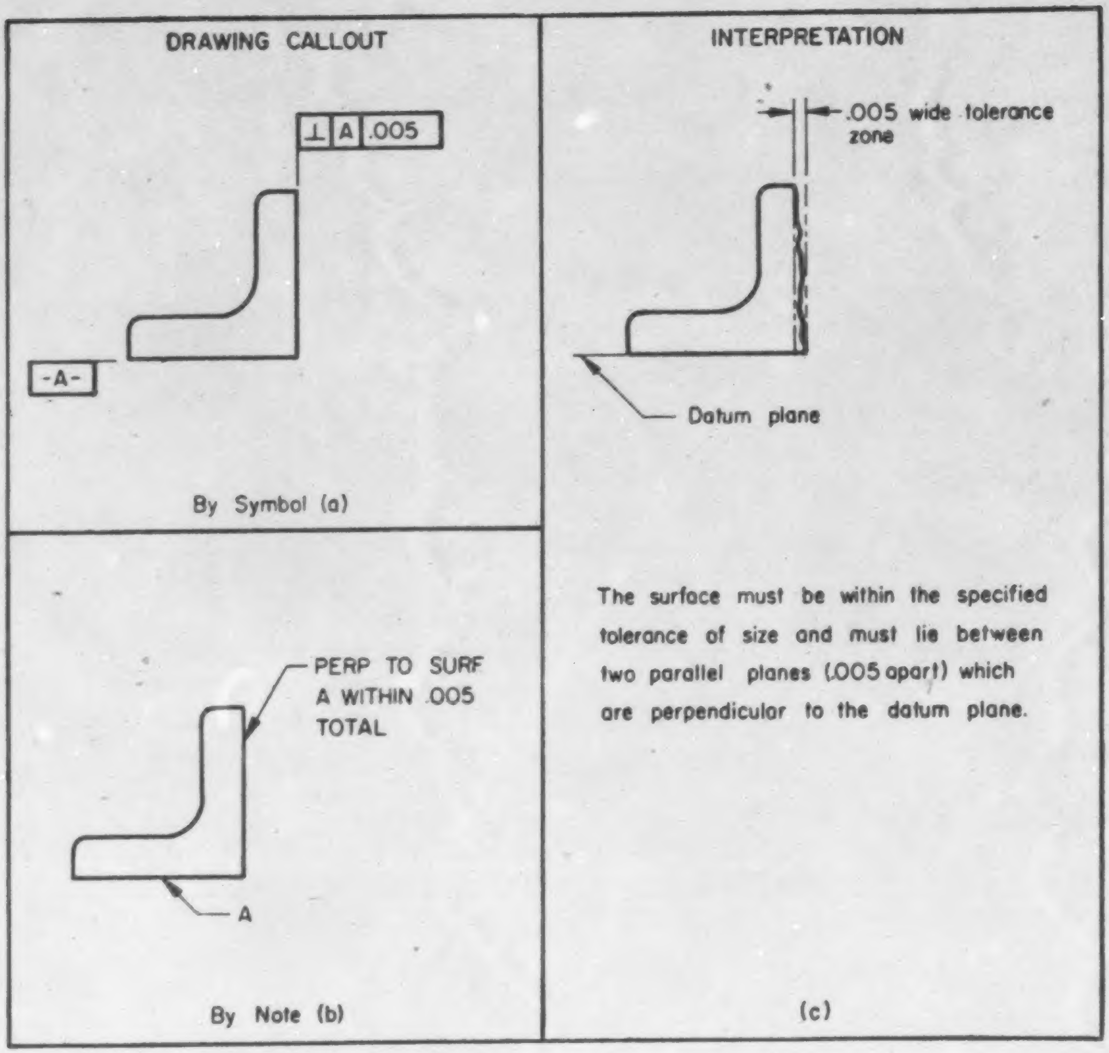

DRAWING CALLOUT
.267
.264
II A .002 Ⓜ
-A-
By Symbol (a)
.267 PAR TO DIA A
.264 WITHIN .002 TOTAL
AT MMC
-A
By Note (b)
INTERPRETATION
Possible position of the feature axis
Datum axis
(c)

Feature size	Parallelism tolerance diameter allowed
.264	.002
.265	.003
.266	.004
.267	.005

The feature axis must be within the specified tolerance of location. Where the feature is at maximum material condition (.264) the maximum parallelism tolerance is .002 diameter. Where the feature is larger than its specified minimum size, an increase in the parallelism tolerance is allowed.

FIGURE 17

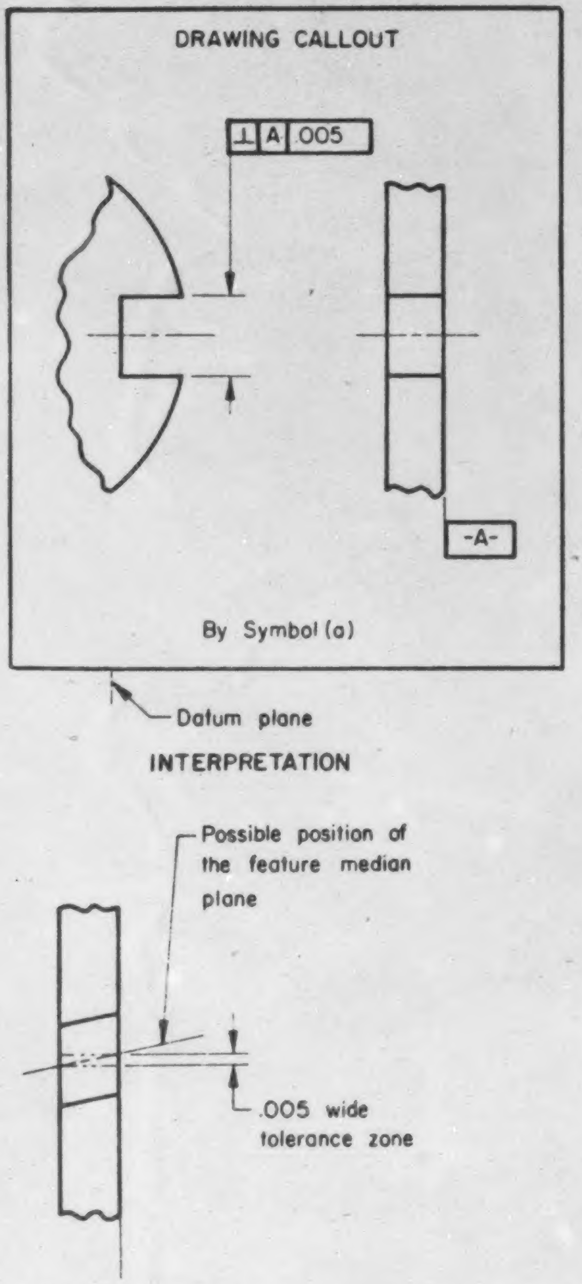
Specifying Parallelism (Feature at MMC and Datum Feature at RFS)*


DRAWING CALLOUT
⊥ A .005
-A-
By Symbol (a)
PERP TO SURF
A WITHIN .005
TOTAL
A
By Note (b)
INTERPRETATION
.005 wide tolerance zone
Datum plane
(c)

The surface must be within the specified tolerance of size and must lie between two parallel planes (.005 apart) which are perpendicular to the datum plane.

FIGURE 18

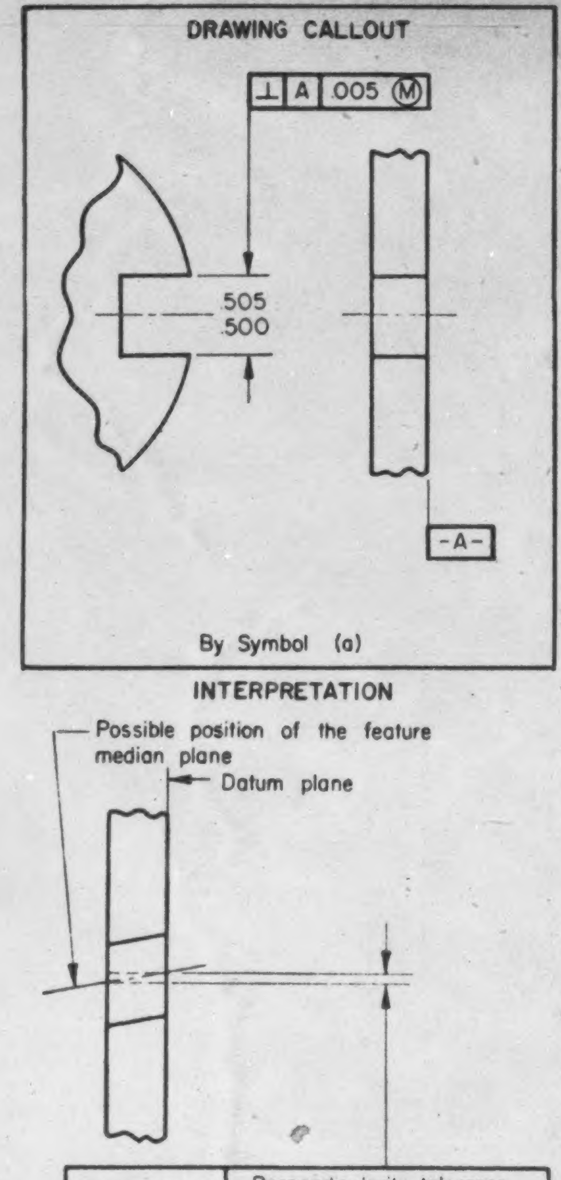
Specifying Perpendicularity*


DRAWING CALLOUT
⊥ A .005
-A-
By Symbol (a)
Datum plane
INTERPRETATION
Possible position of the feature median plane
.005 wide tolerance zone

The feature median plane must be within the specified tolerance of location. Regardless of the actual size of the feature, its median plane must lie between two parallel planes (.005 apart) which are perpendicular to the datum plane.

FIGURE 19

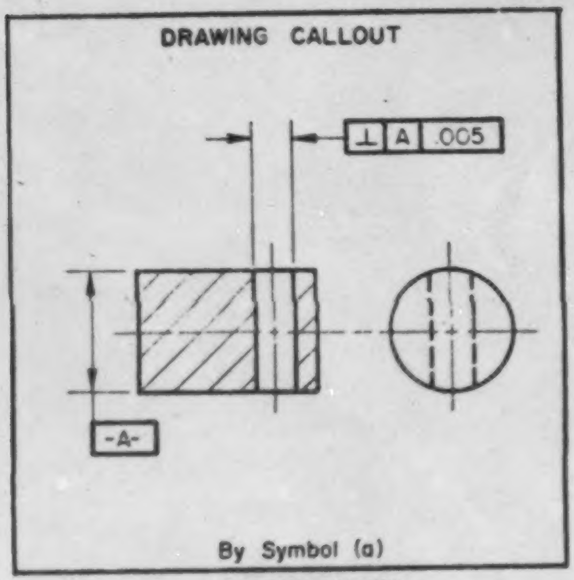
Noncylindrical RFS


DRAWING CALLOUT
⊥ A .005 Ⓜ
.505
.500
-A-
By Symbol (a)
INTERPRETATION
Possible position of the feature median plane
Datum plane

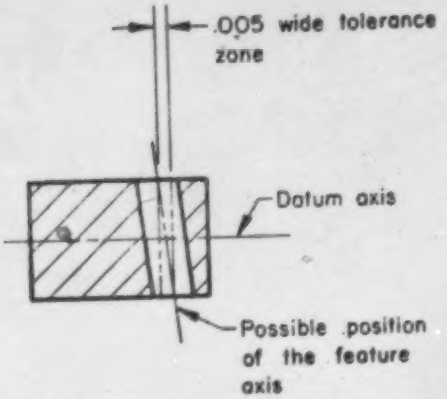
Feature size	Perpendicularity tolerance width allowed
.500	.005
.501	.006
.502	.007
.503	.008
.504	.009
.505	.010

The feature median plane must be within the specified tolerance of location. Where the feature is at maximum material condition (.500) the maximum perpendicularity tolerance is .005 wide. Where the feature is larger than its specified minimum size, an increase in the perpendicularity tolerance is allowed.

FIGURE 20
Noncylindrical at MMC


DRAWING CALLOUT
⊥ A .005
-A-
By Symbol (a)

INTERPRETATION

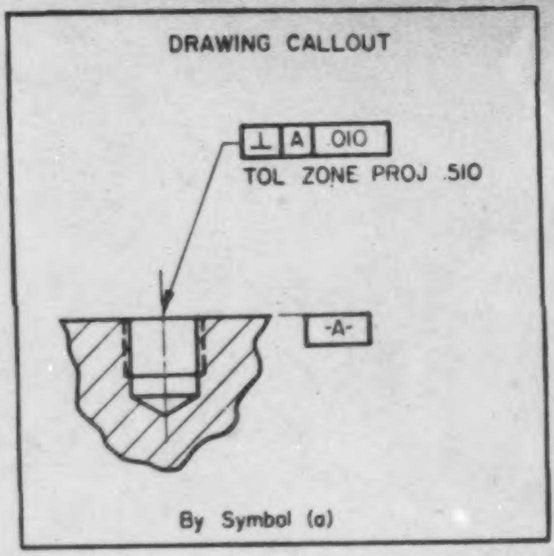

.005 wide tolerance zone
Datum axis
Possible position of the feature axis

The feature axis must be within the specified tolerance of location and must lie between two planes (.005 apart) which are perpendicular to the datum axis.

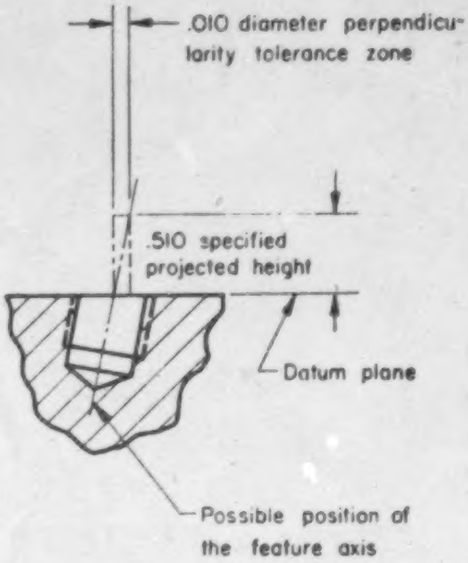
NOTE: This tolerance applies only to the view on which it is specified. In the end view, if it is necessary to control the intersection of the feature axis and the datum axis to a finer degree than the specified tolerance of location, it should be so specified by a separate note.

FIGURE 21

Cylinder


DRAWING CALLOUT
⊥ A .010
TOL ZONE PROJ .510
-A-
By Symbol (a)

INTERPRETATION


.010 diameter perpendicularity tolerance zone
.510 specified projected height
Datum plane
Possible position of the feature axis

The feature pitch diameter axis must be within the specified tolerance of location and must lie within a cylindrical zone which is perpendicular to and projects from the datum plane for the specified height.

Note: Specifying MMC is not practical because of the centralizing effect of mating screw threads when tightened.

FIGURE 22

Threaded Holes

Specifying Perpendicularity*

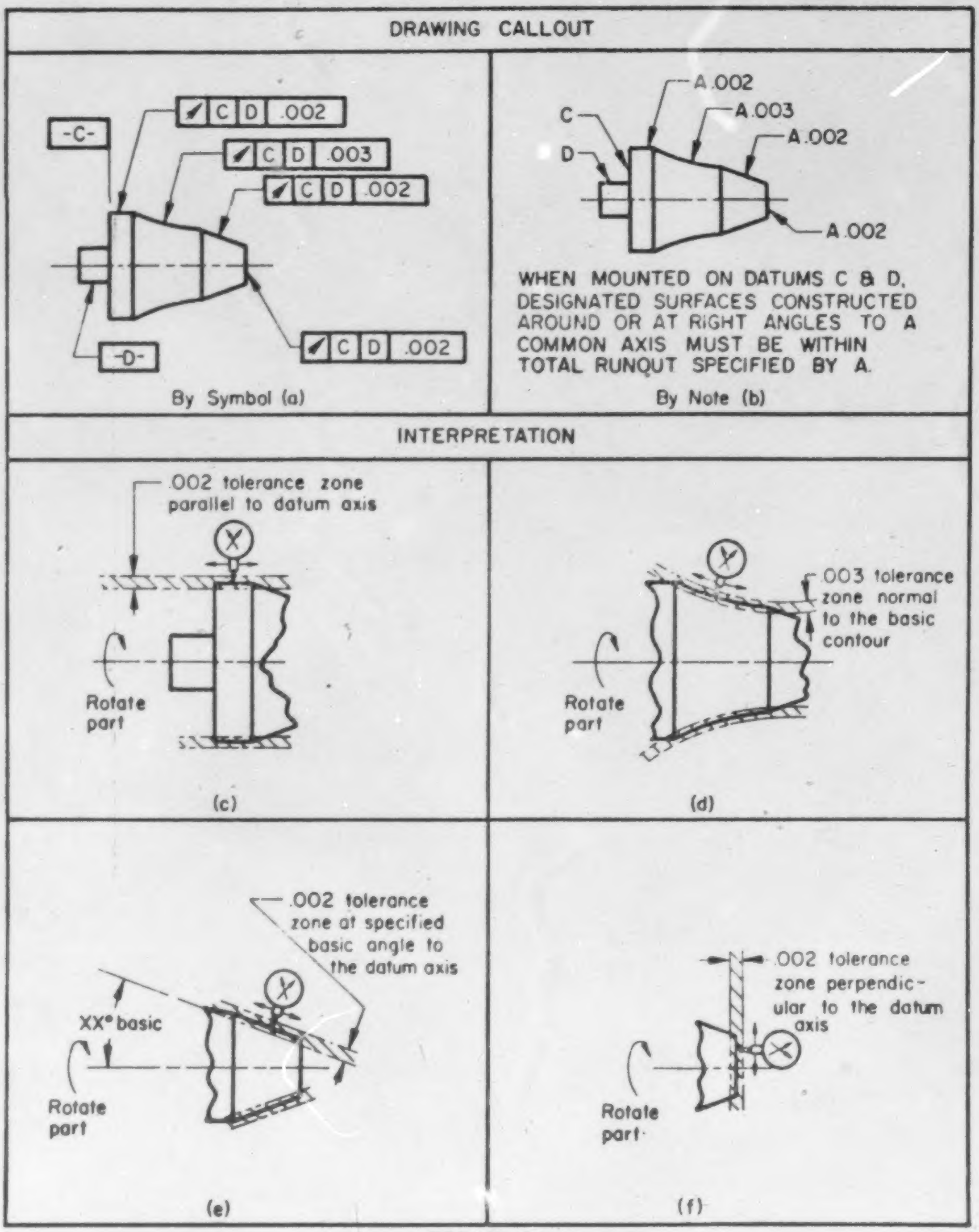

DRAWING CALLOUT
-C-
C D .002
C D .003
C D .002
-D-
C D .002
By Symbol (a)
A .002
C
A .003
A .002
D
A .002
WHEN MOUNTED ON DATUMS C & D, DESIGNATED SURFACES CONSTRUCTED AROUND OR AT RIGHT ANGLES TO A COMMON AXIS MUST BE WITHIN TOTAL RUNOUT SPECIFIED BY A.
By Note (b)
INTERPRETATION
.002 tolerance zone parallel to datum axis
Rotate part
(c)
.003 tolerance zone normal to the basic contour
Rotate part
(d)
.002 tolerance zone at specified basic angle to the datum axis
XX° basic
Rotate part
(e)
.002 tolerance zone perpendicular to the datum axis
Rotate part
(f)

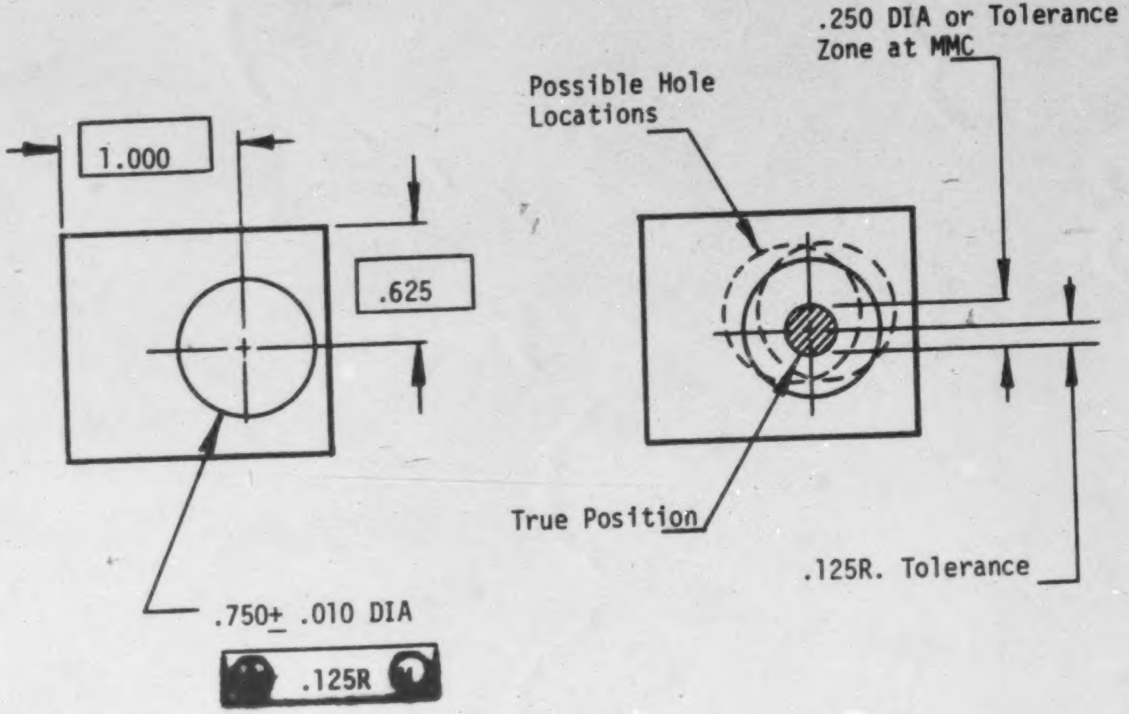
FIGURE 23

Runout Tolerance Zone*

Position Tolerancing

This next group of examples defines tolerances of position. True position is the exact theoretical dimension between features. The difference between the true position system and the bilateral or rectangular system is:

1. Identification of the datum for each dimension.
2. Definition of the tolerance zone.

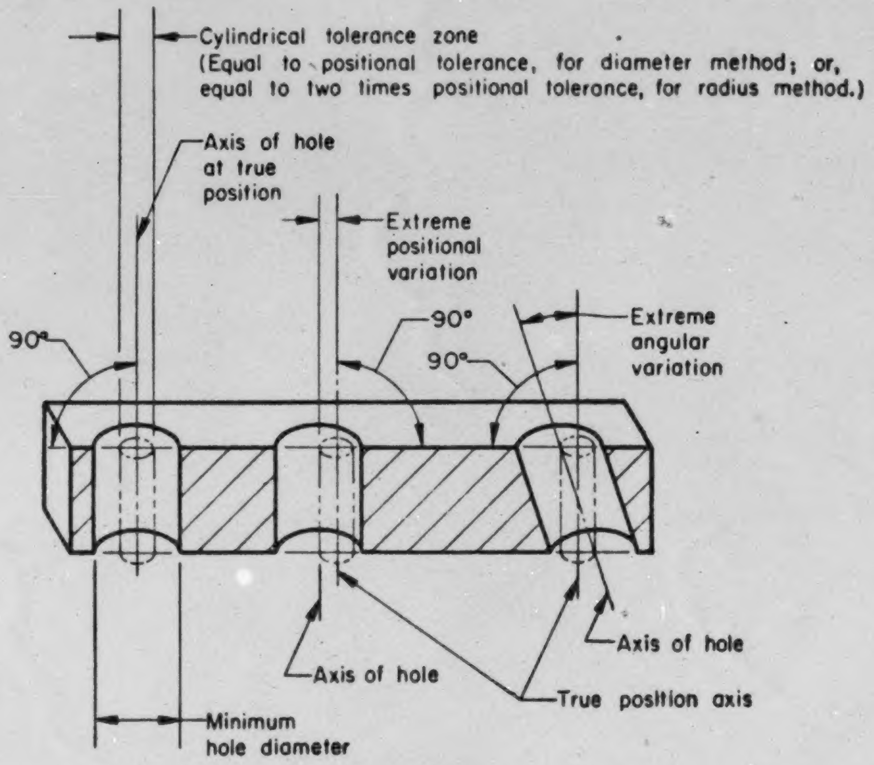

1.000
.625
.750± .010 DIA
.125R
Possible Hole Locations
.250 DIA or Tolerance Zone at MMC
True Position
.125R. Tolerance

By Symbol

FIGURE 24

Interpretation

Axis of hole (MMC) must be within a .250 DIA cylinder whose center is at true position. As the hole gets larger the positional tolerance can increase (total) by that amount.


Cylindrical tolerance zone
(Equal to positional tolerance, for diameter method; or, equal to two times positional tolerance, for radius method.)
Axis of hole at true position
Extreme positional variation
90°
90°
90°
Extreme angular variation
Axis of hole
Axis of hole
True position axis
Minimum hole diameter

Axis of hole is coincident with true position axis

Axis of hole is located at extreme position to the left of true position axis (but within tolerance zone)

Axis of hole is inclined to extreme position within tolerance zone

(a) (b) (c)

Note that the length of the tolerance zone is equal to the length of the feature, unless otherwise specified on the drawing.

FIGURE 25

Figure 25 gives a further explanation of the hole axes in relation to tolerance zone.*

As a hole increases in size (from MMC) to its upper tolerance, the total increase can be added to the true position tolerance. Figure 26 illustrates this.

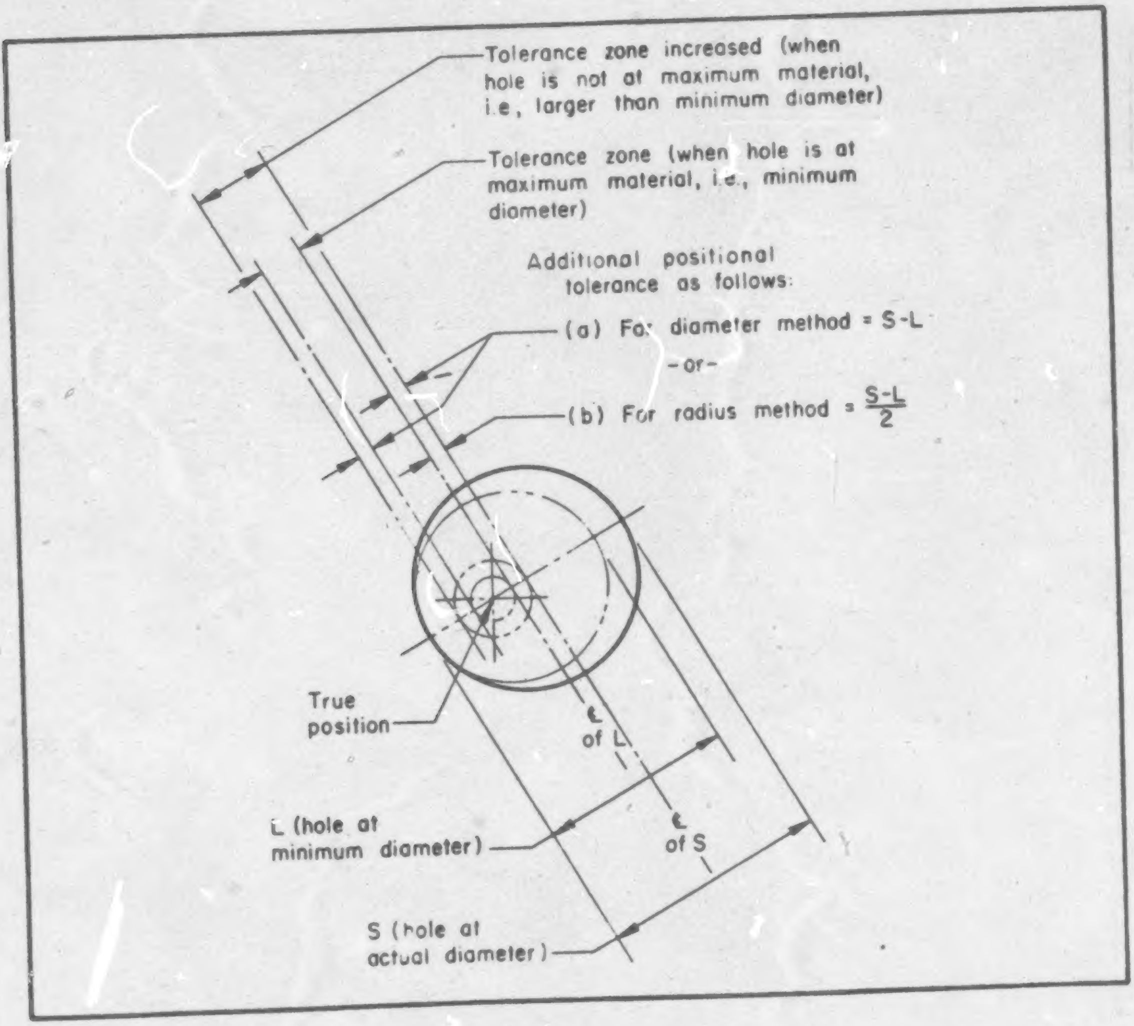

Tolerance zone increased (when hole is not at maximum material, i.e., larger than minimum diameter)
Tolerance zone (when hole is at maximum material, i.e., minimum diameter)
Additional positional tolerance as follows:
(a) For diameter method = S-L
-or-
(b) For radius method = $\frac{S-L}{2}$
True position
℄ of L
℄ of S
L (hole at minimum diameter)
S (hole at actual diameter)

FIGURE 26

Increase in true position tolerance where hole is not at MMC.*

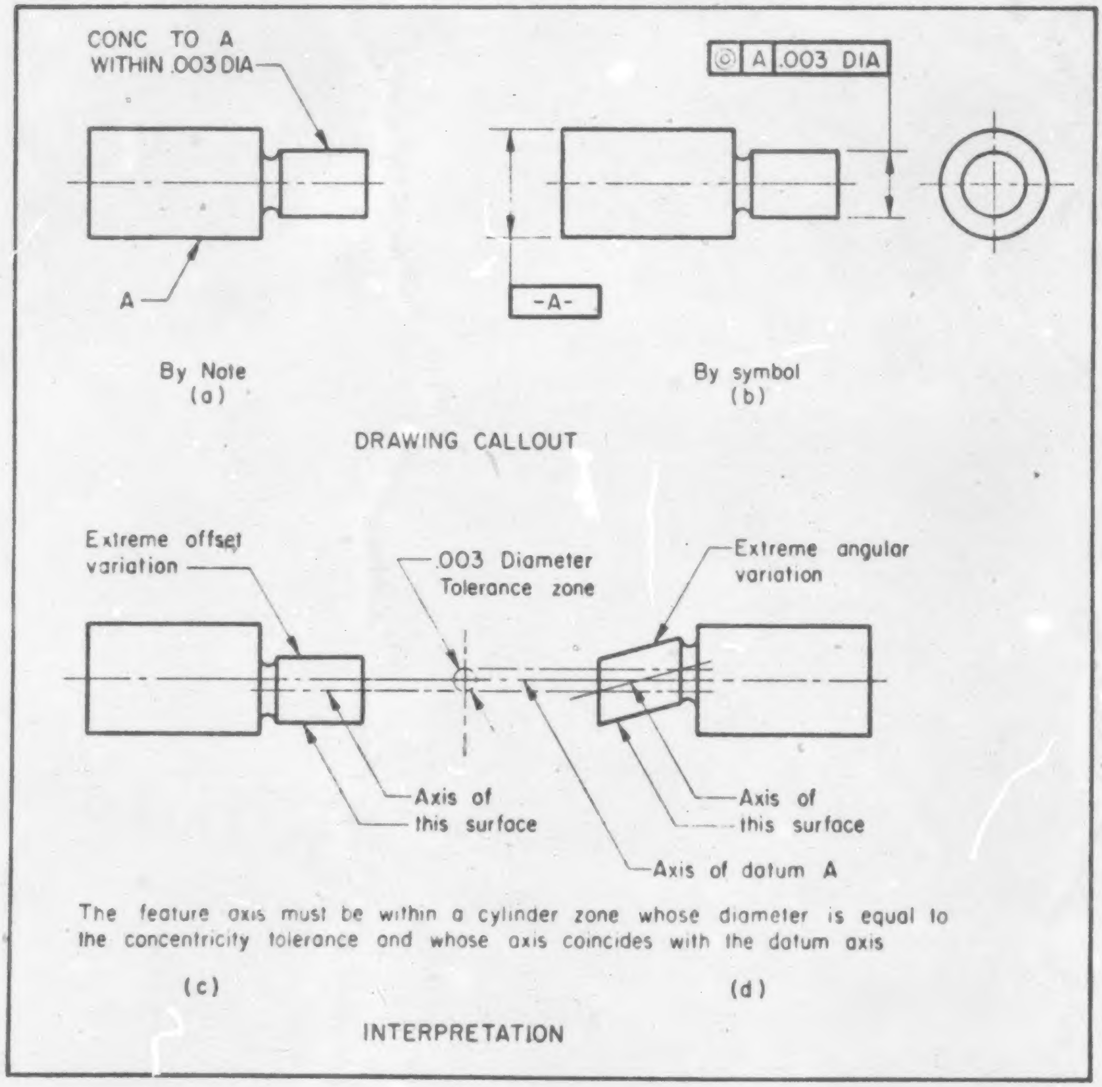

CONC TO A
WITHIN .003 DIA
A
⊚ A .003 DIA
-A-
By Note
(a)
By symbol
(b)
DRAWING CALLOUT
Extreme offset variation
.003 Diameter Tolerance zone
Extreme angular variation
Axis of this surface
Axis of this surface
Axis of datum A
The feature axis must be within a cylinder zone whose diameter is equal to the concentricity tolerance and whose axis coincides with the datum axis
(c)
(d)
INTERPRETATION

FIGURE 27

Concentricity callout and interpretation.*

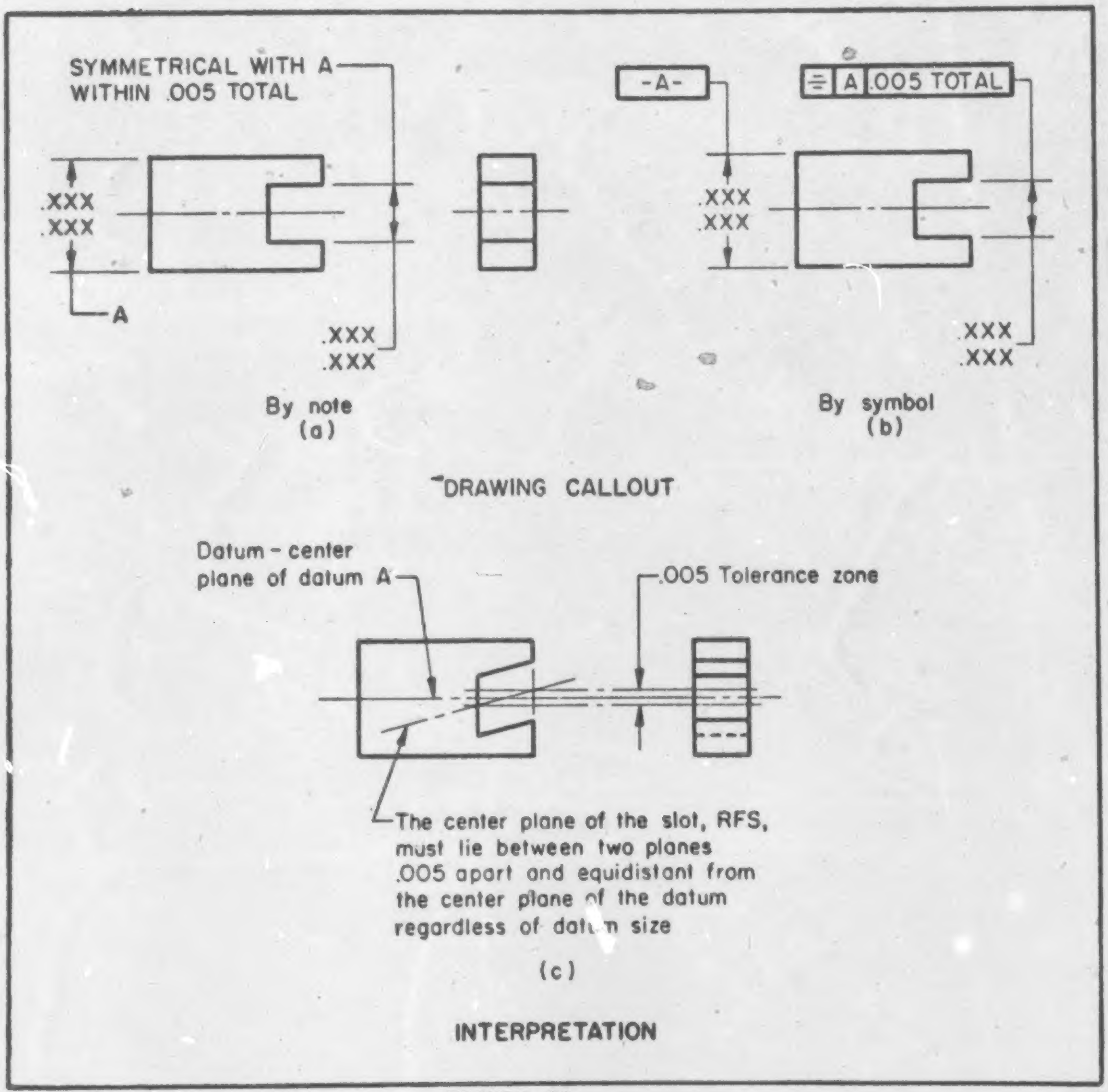

SYMMETRICAL WITH A
WITHIN .005 TOTAL
.XXX
.XXX
A
.XXX
.XXX
By note
(a)
-A-
⌯ A .005 TOTAL
.XXX
.XXX
.XXX
.XXX
By symbol
(b)
DRAWING CALLOUT
Datum - center
plane of datum A
.005 Tolerance zone
The center plane of the slot, RFS, must lie between two planes .005 apart and equidistant from the center plane of the datum regardless of datum size
(c)
INTERPRETATION

FIGURE 28

Symmetry callout and Interpretation*

The concepts of geometric and postional dimensioning are difficult, at first, to grasp. One must work with the concepts for a while and apply them in different types of situations. An indepth understanding of the concepts will follow a working application.

Participate in the activities listed and refer to the references (page 32) to clear up any concepts, definitions, symbols, etc. you are having difficulty in applying.

REFERENCE SECTION

The contents of this package does not cover all there is to learn about geometric and positional dimensioning. For further information, the following references are recommended:

(For an overview of the subject see one of the following,)

Giesecke, Frederick E., Technical Drawing, 5th ed. (New York: Macmillian, 1971). pp. 357-367.

Giachino, Joseph W. and Henry J. Beukema. Engineering-Technical Drafting and Graphics, 2nd ed. rev. (Chicago: American Technical Society, 1968). pp. 165-172.

Luzadder, P. E., Fundamentals of Engineering Drawing, 6th ed. (Englewood Cliffs, New Jersey: Prentice-Hall, 1971). pp. 274-381.

(For a more indepth coverage of the subject refer to one of the following and consult the index or table of contents for the area under question.)

Utter, R. F., The True Positioning Dimension System. (Chicago: Central Scientific Company).

Foster, Lowell W., A Treatise on Geometric Dimensioning and Tolerancing. Rev. ed. (Minneapolis: Honeywell, 1967).

Yuen, Audrey N., True Position Reference Book, (Cambridge Mass: Tad Institute).

Boeing Company. Geometric and Positional Dimensioning and Tolerancing. Industrial Relations Training Manual.

USA Standard Drafting Practices, Dimensioning and Tolerancing for Engineering Drawings (USASI Y14.5-1966), (New York: American Society of Mechanical Engineers, 1966).

Activity: Geo. and Pos. Dim.-V-1

Name ______________________________

Period ______________________________

What is Geometric and Positional Dimensioning?

Question: Explain or define in your own words, what the geometric and positional dimensioning system is.

Activity: Geo. and Pos. Dim.-V-2A

Name ______________________

Period ______________________

Terms

Question: Define the following terms:

Basic -

Datum -

Feature -

Reference -

True position -

Maximum material condition -

Regardless of feature size -

Activity: Geo. and Pos. Dim.-V-2B

Name ______________________

Period ______________________

Terms

Procedure: Refer to Figure 5, page 14, and give an example of where each of the following terms are used or can be applied by sketching the feature or symbol.

Basic -

Datum -

Feature -

Reference -

True position -

Maximum material condition -

Regardless of feature size -

Activity: Geo. and Pos. Dim.-V-3A Name ____________________

Period ____________________

Types of Geometric and Positional Dimensioning

Questions: 1. Name the two types of tolerances the geometric and positional tolerancing symbols are divided into.

2. How do they differ?

Activity: Geo. and Pos. Dim.-V-3B-5B Name ______________________

Period ______________________

Types and Symbols for Geometric and Positional Dimensioning

Procedure: On an 'A' size piece of drawing paper:

1. Draw each of the geometric symbols.
2. Arrange these into the two types of symbols.
3. Label the two types.
4. Label each symbol with the characteristic it describes.

Use proper symbol sizes, lettering, title block, drafting standards, etc.

Activity: Geo. and Pos. Dim.-V-4A

Name ______________________

Period ______________________

Why or Why Not Use Geometric and Positional Dimensioning?

Discuss the advantages and disadvantages of using the geometric and positional dimensioning system.

Activity: Geo. and Pos. Dim.-V-4B

Name ______________________________

Period ______________________________

Comparing the Two Drawing Systems

Procedure:

1. Obtain two mechanical drawings.
    a. One dimensional with the conventional system.
    b. The other using geometric and positional dimensioning.

2. Compare the drawings and answer the following questions about each.
    a. How are the features of a object described?
    b. Are relationships between features clearly defined or implied?
    c. Are the datums easily identified?
    d. Does only one system have to be used?

Activity: Geo. and Pos. Dim.-V-5A

Name ______________________________

Period ______________________________

Geometric Symbols

Procedure: Turn back to Figure 5 (page 14) and answer the following questions about each geometric symbol used:

1. Name of the characteristic being defined.
2. Shape of the feature being defined.
3. Datum (if any) related.
4. Shape of datum.
5. Tolerance zone size limits.
6. Shape of the tolerance zone (sketch it).

Activity: Geo. and Pos. Dim.-V-5C

Name ______________________________

Period ______________________________

Interpreting Geometric and Positional Dimensions

Questions: Given the following information from the inspection of a part, answer these questions about each diameter listed:

1. What is the total true position allowable for each diameter?
2. What is the true position diameter created by the actual mislocation?
3. Is the part acceptable?
4. Is it possible to correct the part?
5. If so, how can it be corrected?

Conditions	Dia. #1	Dia. #2	Dia. #3
Drawing callout for hole size diameter	.500 + .008 - .001	.250 + .005 .001	.375 + .005 - .001
Drawing callout for true position diameter	.014	.012	.010
Actual hole size diameter produced	.499	.251	.375
Actual horizontal mislocation	.005	.006	.006
Actual vertical mislocation	.003	.002	.004

Activity: Geo. and Pos. Dim.-V-6 Name ____________________

Period ____________________

Using Geometric and Positional Dimensioning

Procedures:

1. Obtain a mechanical drawing that you have completed.
2. On a print or separate sheet of paper, sketch and redimension using geometric tolerancing in place of the conventional system.
3. Check the tolerances used with your instructor.
4. Redraw using correct geometric symbols and conventions.

Activity: Geo. and Pos. Dim.-V-7

Name ____________________

Period ____________________

Applying Geometric and Positional Dimensioning

Procedures: From the layout supplied on the next page:

1. Scale and detail each part.
2. Apply geometric and position controls to those features which need to be controlled.

Activity: Geo. and Pos. Dim.-V-B

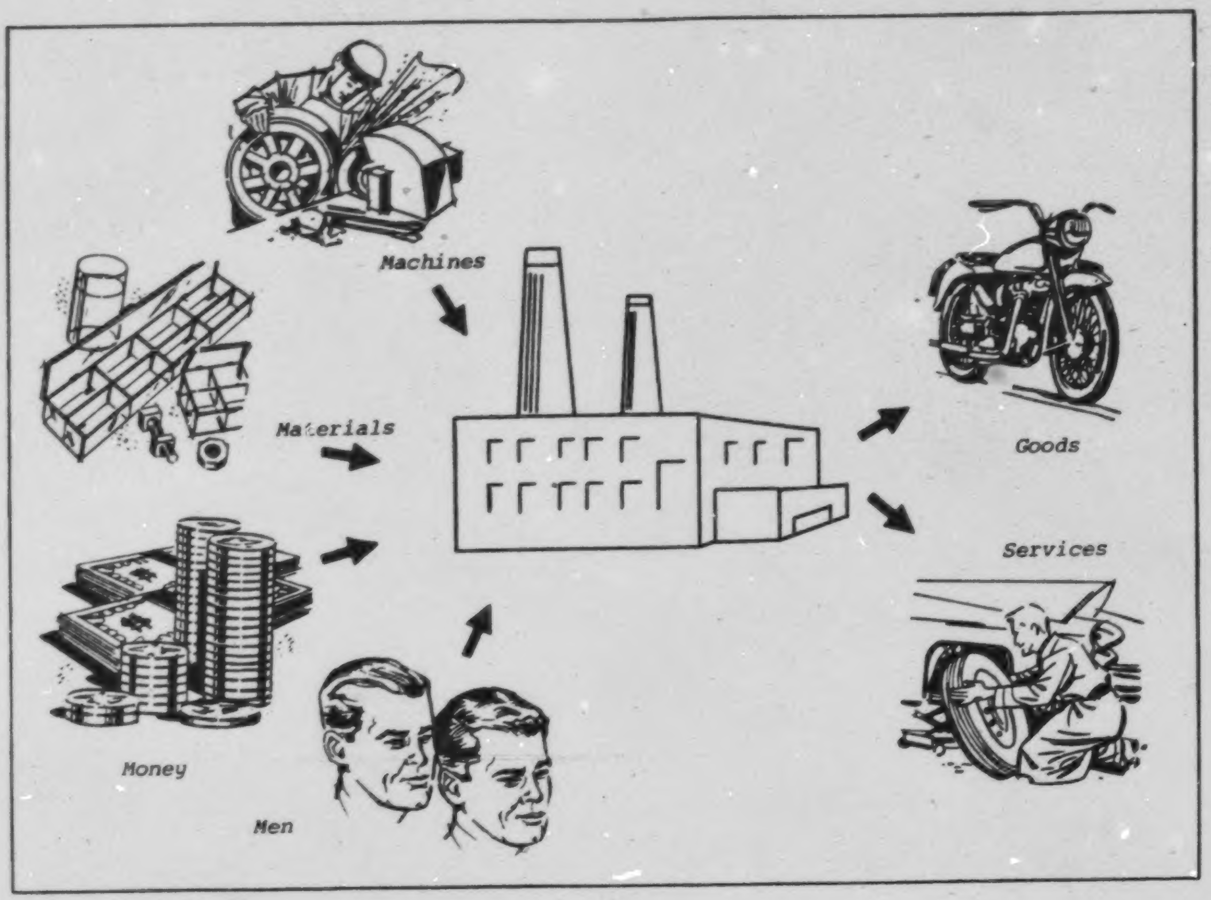
Name ______________________

Period ______________________

Try To Use Geometric and Positional Dimensioning

Procedure: On the next drawing job you have assigned to you, apply geometric and positional controls to those features which, in your opinion, need to be controlled. There is no actual work to be completed on this activity.

LAB MAINTENANCE PLAN DEVELOPMENT


Machines
Materials
Goods
Services
Money
Men

Prepared as an Aid in Implementing
The Wisconsin Guide to Local Curriculum
Improvement in Industrial Education, K-12

Activity Package

Prepared as an Aid in Implementing
The Wisconsin Guide to Local Curriculum
Improvement in Industrial Education, K-12

This package applies to the following industrial elements:

Research and Development
Maintenance and Service
Management
Communications

For experienced students of grades 11 or 12

Pertaining to Field Objectives One and Five

"To work with the elements of industry to gain an
understanding of how they function in producing
goods and services."

"To prepare for entry into appropriate
industrially related occupations and develop
a base for further occupational education."

Produced by

The Industrial Education Instructional
Materials Development Project
University of Wisconsin-Stout
Menomonie, Wisconsin

Project Director:

Lawrence S. Wright, Ed.D.

Assistant Director:

M. James Bensen, Ed.D.

Project Coordinator:

John M. Ritz, M.S.

Contributor to this Package:

Thomas Burt

Supported by:

The Wisconsin Department of Public Instruction;
The Graduate College and the Center for Vocational,
Technical and Adult Education, both of the
University of Wisconsin-Stout

Information:

In this activity you will develop a useful and comprehensive maintenance plan for the upkeep and repair of the tools and equipment in the laboratory. This is a major project and it will require a conscientious and sustained effort on your part throughout the semester. Your goal is a package that will provide all of the information and guidance necessary to maintain the equipment which is normally the responsibility of the instructor. In other words, you will exclude the maintenance normally performed by the custodians. In the maintenance plan, you should include maintenance policies, standards for the condition of the equipment and the quality of the repair work, and a schedule for the preventative maintenance and normal repairs to the equipment.

Useful References, Tools, and Equipment:

The following list includes resources which will aid you in developing the maintenance plan. It is not meant to be complete.

1. Library Resources - Look in the school library or public library for books on maintenance, maintenance management, tool repair or related subjects.
2. Industrial Firms - A maintenance department supervisor in an industrial plant may be able to provide useful information on his maintenance plan. He may also have useful references on the subject.
3. Owner's and Operator's Manual - These resources which come with the equipment should provide substantial input into your plan. Your instructor should have most of the ones you need.
4. Equipment Manufacturers - Manufacturers of the lab equipment can supply information on proper maintenance.
5. Your Instructor - Although this is an independent project, your instructor can provide a good deal of the information you will need.
6. Tools and Equipment in the Lab - You may find it useful to actually perform maintenance on some of the machines to aid you in describing the procedure, determining skill required to perform the task, etc.

Suggested Procedure:

The following steps are suggestions only. Remember, your task is to develop a useful, complete maintenance plan. It will be evaluated on its merits as a plan for maintaining the equipment, not on how closely you followed the outline.

1. Establish the policies for maintaining the equipment.
    - A. Consider the needs of the owners and management (school board and administration), the supervisor (instructor), and the workers (students).
    - B. Tell why the maintenance plan and the policies you have established are important.
    - C. State the purpose and objectives of your maintenance plan.
2. Collect the information on the maintenance of the equipment.
    - A. First seek advice on how to organize a maintenance plan. You could begin with the instructor.
    - B. Collect information on maintenance procedures and schedules for each tool and machine in the shop.
    - C. Estimate time required to perform the tasks.
    - D. Determine the skill required to perform the maintenance. (For example, you could use skill categories such as Beginning Student, Intermediate Student, Advanced Student, Instructor, Special Serviceman, etc.)
3. Compile the information into a maintenance plan.
    - A. A looseleaf notebook is one possibility for organizing the plan.
    - B. Follow an annual maintenance cycle in constructing the schedule.
    - C. The schedule could be designed to specify the maintenance tasks on a week-by-week basis. For example, you could devise a chart listing the maintenance tasks to be performed for the week - you would need one chart for each week of the school in order to spread the tasks out. Here's one possibility:

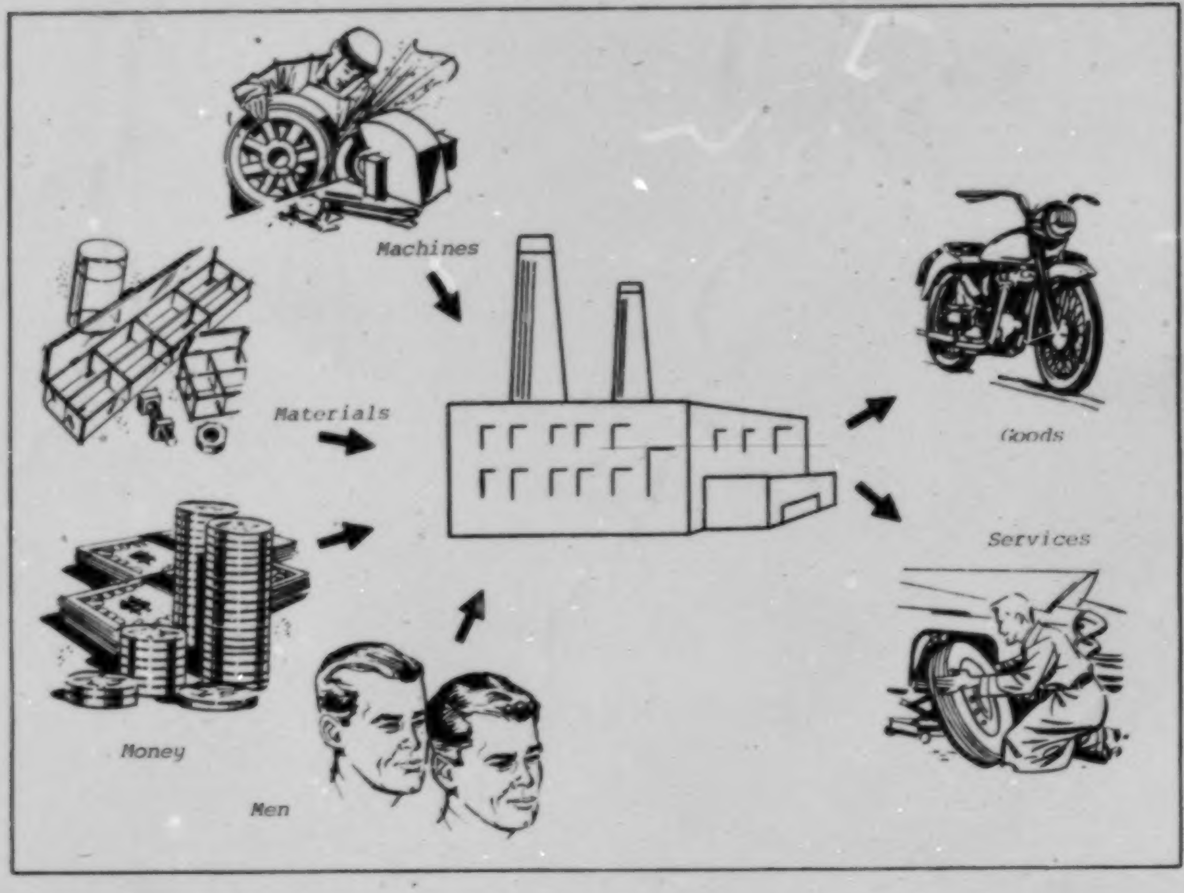
Lab Maintenance for Week of October 10

Task	Skill Level	Time to Perform	Completed
Sharpen Surface Blades	Instructor	6 hours	

D. Include procedures in the plan for the maintenance tasks specified in the schedules.

THE ENTERPRISE

JUL 25 1975


Machines
Materials
Money
Men
Goods
Services

Prepared as an Aid in Implementing
The Wisconsin Guide to Local Curriculum
Improvement in Industrial Education, K-12

Learning Activity Package

Prepared as an Aid in Implementing
The Wisconsin Guide to Local Curriculum
Improvement in Industrial Education, K-12

The Enterprise

Middle-Junior High School

Pertaining to Field Objective Number One

"To work with the elements of an enterprise
to gain understanding of how they function
in producing goods and services."

Produced by

The Industrial Education Instructional
Materials Development Project
University of Wisconsin-Stout
Menomonie, Wisconsin

Project Director:

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RATIONALE:

Since we live in an industrial-technological culture, it is important that we understand this culture. The reason for studying industry and technology is that someday we must take our places and live in these surroundings as workers. Industry and technology is the base of our culture and economy. If we study and understand the elements of industry (users of technology), we will better understand our culture. In order to study industry, it is easier to choose one part of industry and examine it to see how it works. To do this, we are going to examine an enterprise (business) and see what must take place for it to operate successfully.

This package explains what an enterprise (business) is and breaks it down into its eleven basic parts or elements. Pay careful attention to this lesson, it is the basis for the study of industry and the foundation for your future career choices.

OBJECTIVES

After reading this information, you will have gained an understanding of how an enterprise functions in producing goods and services.

To assist your understanding:

1. In your own words, distinguish between the terms enterprise and industry.
2. You will present two logical statements explaining why individuals establish enterprises.
3. You will list and explain all eleven elements basic to the existence of all enterprises.
4. You will explain how and why a classroom enterprise interprets an actual industrial enterprise.

Options: Attempt the self-test on the following pages and then check the following selections that apply to you.

___ If you answered all the questions without guessing:

 ___ A. See the instructor for a teacher evaluation.

 ___ B. Take the self-test as a self evaluating device, then see your instructor.

___ If you had to guess to answer the questions:

 ___ A. Review the self-test to see what objectives your studying should be based upon, then turn to the media section on page 5.

 ___ B. Skip the self-test and turn to the media section on page 5 to help you achieve the objectives.

Self-Test: Answer the following questions. You may write in this booklet.

1. What does the term industry mean?

2. Define the term enterprise.

3. Explain how the terms enterprise and industry are different.

4. What are two reasons why individuals set-up enterprises.

   A.

   B.

5. Explain the following eleven elements which are basic to all enterprises.

   A. Communications -

   B. Management -

   C. Finance -

   D. Human Resources -

   E. Property -

F. Power and Energy -

G. Materials -

H. Research and Development -

I. Production -

J. Marketing and Distribution -

K. Maintenance and Services -

6. In your own words, explain how a classroom enterprise represents an actual industrial enterprise.

MEDIA SECTION

Objective Number 1: In your own words, you will distinguish between the terms enterprise and industry.

Optional Media: Choose one or more of the following

- ___ Read page 7 of this package.
- ___ Read American Industry Student Booklet Number 1, "Industry Today", pages 4-6.
- ___ Read the definitions from the standard dictionary.
- ___ View the American Industry movie.

Optional Activities: Choose one or more of the following activities included in this package.

Activities: Enterprise - I-1A thru 1C

Objective Number 2: You will present two logical statements explaining why individuals establish enterprises.

Optional Media: Choose one or more of the following.

- ___ Read page 7 and 8 of this pachage.
- ___ Read American Industry Student Booklet Number 1, "Industry Today", pages 4-6.

Optional Activities: Choose one or more of the following activities included in this package.

Activities: Enterprise - I-2A or 2B

Objective Number 3: You will list and explain all eleven elements basic to the existence of all enterprises.

Optional Media: Choose one or more of the following.

- ___ Read pages 8 to 13 of this package.
- ___ Read pages 9 thru 11 of package entitled an "Overview of Industrial Arts".

Optional Activities: Choose one or more of the following activities in this package.

Activities: Enterprise - I-3A thru 3C

Objective Number 4: You will explain how and why a classroom enterprise interprets an actual industrial enterprise.

Media:

___ Read page 13 and 14 of this package.

Optional Activities: Choose one or more of the following activities included in this package.

Activities: Enterprise - I-4A thru 4D

INFORMATION SECTION

Enterprise and Industry

To understand how an enterprise or business is organized, it is important to first know what the terms industry and enterprise mean. An enterprise is often called a business. It is a combination of human resources, money, materials, and knowledge which are engaged in making a saleable product or service. It is hoped by doing this that a profit will be made. An enterprise is considered to be made up of only one firm or business. The corner candy store, Greyhound Bus Company, and General Motors are considered enterprises.

Industry is an institution within society that develops and uses technology together with human and natural resources to develop, produce, distribute, and service something of value. Industry can be differentiated from an enterprise. Industry is a collection of all the enterprises or businesses involved in making similar products or services. American Motors, Ford, General Motors, and Chrysler Corporation grouped together make up the American automobile industry.

Can you think of any other enterprises that make up an industry?

Why Start an Enterprise?

Generally speaking, people are considered lazy. They do not perform tasks or hard labor unless they have reasons to do so. The question that is often asked is, "What will it do for me?" "How much can I make?"

Enterprises organize people, money, materials, and know-how in hopes of producing a piece of merchandise or a necessary service that people will want and buy. These businesses have been generally established to make money or a profit. There are enterprises that have also been organized for the purpose of helping people, and not to make money. These are usually financed (supported) by other groups and are not interested in profits. Examples of this type of industry are the Red Cross, hospitals, and social welfare agencies.

Though there are businesses that are set-up merely for helping society, the majority of enterprises have been founded for the purpose of "what will it do for me" or making a profit.

Without a goal of producing goods or services to make life better for living or to make money, the enterprise system would have never been started.

Needs of an Enterprise

Whenever an enterprise or business is started, it is because a person or group of people develop an idea that will provide goods or services for people. With an idea alone, nothing will happen. If the eleven elements of industry are added and built around the idea, a productive enterprise will usually develop. Suppose the members of your class developed the idea of building kites. You want to make enough kites to sell and make a profit. This example will be used to explain the eleven elements needed in order for your class to form an enterprise.

First the class would have to set up a *communication* chain. Communications is a process used to exchange ideas and information. If an enterprise does not use the communication element, a product or service would not get produced. The original idea of the kite would not even be able to be discussed among your class. Communications is the act of conveying ideas by means of signs and symbols for the purpose of getting things done. When a product or service is being produced, communication takes place either orally or in a written manner.

The next step involved in producing a good or service would be to develop some form of *management*. After the idea of the kite was discussed, a leader should be appointed to organize the members of the class that want to make the kites. Management is the operating activities which provides for the leadership of an enterprise. The class should vote to elect a president and other leaders. These leaders will be the backbone of the company. They will make the decisions and be responsible for the success or failure of the company. Some of the management positions of a company are the president, vice president of production, vice president of administration, and vice president of marketing. There are many other management positions in enterprises. They will be further discussed when we cover the human resources element of an enterprise.

The communications and management elements are referred to as coordinating elements. They are required to bring resources together so that goods and services may be produced by an enterprise.

Now that our class has set up a coordinating channel, we are ready to proceed a step further. In order to make our kites, we need money or financial support. *Finance* involves the securing of money to start a business. Such things as sources of money, cost of borrowing money, and the control

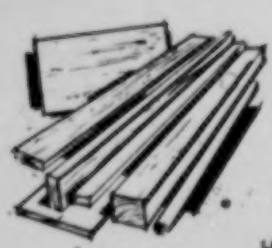
and recording of its use are involved in finance. A business must communicate with others to see how it can get money needed to start producing goods or services. Your class cannot build kites with only management and communications. Money is needed to buy materials and machines and to pay wages to the people who produce the kites. Your class can get money by making a loan, selling bonds, or selling stock. Many enterprises obtain their financial support by selling stock into their company. What the business is really doing is selling ownership in terms of shares of stock. Those who own stock get a percent of the profit or loss after the business sells its products and services. Probably the easiest way to get the money to produce the kites would be by selling stock to the members of the class. Here each member that purchases the stock would be sharing in the profits or losses made by making the kites.

Now that the class has the communications, management, and finances to build its kites, it must organize its members to perform certain jobs in the production of the kites. This element of an enterprise is referred to as *human resources*. Human resources are essential to an enterprise. They are the people who work to produce the goods and services. They include the laborers, secretaries, bookkeepers, salesmen, and any other persons needed in the successful production of products and services. Without human resources, industry would not be able to exist.

Although we have money and people to produce our kites, we also need to have a building in which we can work and tools and machines to help us perform the work. Buildings, tools, and machines are referred to as *property*. Without these, it is likely that we could not produce our product. In school the property is provided by an equipped industrial arts lab.

Another element essential to an enterprise is that of power and energy. *Power and energy* are used to operate our tools and machines so that the human resources can work more easily. Electricity and muscle power would be the fundamental kinds of power and energy used in producing kites. Without them it would also be impossible to produce goods and services.

The final resource that an enterprise needs to start producing goods and services is that of *materials*. They are worked with to produce goods and services. In building kites, the materials required would be wood, paper, glue, and string. Without materials, an enterprise has nothing to produce.



Finance, Human Resources, Property, Power and Energy, and Materials are the resource elements of an enterprise. Without these an enterprise would not be able to reproduce an idea to make products or services. Resources are the essential elements that an enterprise requires for producing goods and services.

Now that you know about the coordinating and resource elements needed by an enterprise, it is time to look at the systems elements. The systems elements include Research and Development, Production, Marketing and Distribution, and Maintenance and Service. These elements are involved in the actual production of goods and services and the means of getting them to the customers.

Research and Development is a procedure used in investigating ideas for the purpose of arriving at a solution to a need. If your class is to build a kite, it must experiment with materials to see which ones to use. You must build prototypes or models of the kite so you can see how to produce it. You should make drawings of what the kite will look like to see how it can be made. Machines and tools must be set up to see how the kites can be processed. All of the experimentation needed prior to the actual production of a good or service is referred to as research and development.

Production involves the methods and processes used in the output of goods and services. This is where the actual making or processing of the goods and services is accomplished. This could include cutting, gluing, sanding, packaging, and many other processes. But without all the resource and coordinating elements, an enterprise could not proceed this far. Production includes planning how you are going to produce your product and the quality of work to be expected during production.

After a good or service is produced, it must someway get to a consumer or customer. The element of an enterprise which is involved here is that of *marketing and distribution.* It involves the flow of goods and services from the producers to the consumers. In your class this would include the market survey to see who was interested in buying your kites. It would include the advertising of the kites, and the actual sales and delivery of them.

After the goods and services are delivered to the customers, *maintenance and service* should be available to aid customers who have received faulty goods or services. Maintenance and service involves the actual servicing of property, equipment, and people. In your classroom enterprise, maintenance can include oiling of machines and cleaning up after you are finished working. Servicing should be available for goods that have been produced that do not satisfy the customer. If you sold a kite and all the parts were not included in the package, a customers' service area should be available to receive complaints from the customers. An enterprise must be willing to provide services for its products or people would not purchase them.

Now we have reviewed the eleven elements necessary in establishing a successful enterprise. You have probably noticed that all of them are needed if services and goods are to be produced. The eleven elements can be broken down into three classes. These are the system, resource, and coordinating elements. The coordinating elements include communications and management. Finance, human resources, property, power and energy, and materials comprise the resource elements. Finally the system elements are research and development, production, marketing and distribution, and maintenance and service.

Representing Industry in the Classroom

From reading the previous information section and your actual experiences in your industrial arts classes, you should be able to see how a classroom enterprise represents an actual industrial enterprise. All eleven elements exist in both cases. The classroom and industrial enterprise both use men, money, materials, and knowledge to engage in the production of a saleable product or service to meet the needs of man. Though a classroom enterprise operates on a much smaller scale, it can do almost everything a real industrial company does, even make a profit.

Activity: Enterprise - I-1A

Name ____________________

Period ____________________

An Industry and an Enterprise

Procedure: Using the information from this package and other references, explain the meanings of the terms industry and enterprise in the space below.

Activity: Enterprise - I-1B

Name ______________________

Period ______________________

What is an Industry?
What is an Enterprise?

Directions: Choose either the term industry or enterprise, only one. Using examples of communications (sketches, photographs, pictures, etc.) and furnished supplies, design a poster which defines either industry or enterprise.

Activity: Enterprise - I-1C

Name ______________________

Period ______________________

What is an Industry and an Enterprise?

Directions: In this activity you will analyze the terms "industry" and "enterprise". Answer the questions below and construct a definition of "industry" and "enterprise" that you can understand and accept.

1. Using three different sources (such as a dictionary, teacher's book, encyclopedia, etc.) write the definitions of "industry", as given in each source.

   Industry is:

   A.

   B.

   C.

2. Using the above definitions, write in your own words, a simple definition of "industry" that you can understand and accept.

3. Using three different sources, write the definition of "enterprise" as stated in each source. An enterprise is:

   A.

   B.

   C.

4. In your own words, write a definition of "enterprise" that you can understand and accept. You may use the above definitions to help you formulate your own definition.

Activity: Enterprise - I-2A

Name ______________________

Period ______________________

Reasons for Establishing Enterprises

Question: In the space below, list two reasons why individuals have developed enterprises.

Activity: Enterprise - I-2B

Name ______________________________

Period ______________________________

Why Local Enterprises?

Procedures: In your free time after school, visit a local enterprise and ask the merchant his reasons for starting his enterprise. Record these in the space below.

Activity: Enterprise - I-3A

Name ______________________

Period ______________________

The Elements of an Enterprise

Directions: In the space below and on additional paper if needed, explain each of the following terms and describe how they are used by an enterprise.

A. Communications -

B. Management -

C. Finance -

D. Human Resources -

E. Property -

F. Power and Energy -

G. Materials -

H. Research and Development -

I. Production

J. Marketing and Distribution

K. Maintenance and Service

Activity: Enterprise - I-3B

Name ________________________

Period ________________________

Analyzing an Enterprise

Directions: Using the space below, analyze an enterprise of your own selection. You may choose a corner market, candy store, bakery, car dealer, 5¢ and 10¢ store, or another of your choice. You must explain how this enterprise uses all the eleven elements of industry in your analysis.

Activity: Enterprise - I-3C

Name ______________________

Period ______________________

Analyzing a Product or Service

Directions: In the space below and on additional paper if needed, analyze a product or service. You must select an actual good or service (yo-yo, car wash, dry cleaning, ice cream, candy, a chair, a house, a car, etc.) produced by industry or your industrial arts class. After you have made a selection you must trace the product or service through the actual eleven elements of industry which were needed in its production.

Activity: Enterprise - I-4A

Name ______________________

Period ______________________

Classroom vs. Industrial Enterprise

Directions: In the space below explain how or why a classroom enterprise represents an actual industrial enterprise. It may help you in your writing if you think of your class producing a product and an industrial firm producing a product.

Activity: Enterprise - I-4B

Name ____________________

Period ____________________

Comparing Enterprises

Directions: In the space below, write a concise explanation comparing an enterprise your class has formed to an actual industrial enterprise using the eleven elements of industry.

Activity: Enterprise - I-4C

Name ______________________

Period ______________________

Analyzing a Product or Service

Directions: Develop a written report of a product or service you would like to produce as an enterprise product in your industrial education class. This analysis should include how the eleven elements of industry are to be used.

Activity: Enterprise - I-4D

Name ____________________

Period ____________________

Producing a Product or Service

Directions: On another piece of paper, develop a visual report of a product or service your class could use in establishing an enterprise. If you choose to design a product, the reports should include drawings of the product and a list of materials needed to produce it. On the other hand, if you choose to design a service, you should develop an outline describing the service and what is needed to provide that service. When you are finished, discuss your ideas with the teacher.

Student Evaluation

The Enterprise

Name ______________________

Instructor ______________________

School ______________________

Directions: Answer all of the following questions to the best of your ability. The questions are written to evaluate your knowledge and understanding of the area of industrial arts covered in this package. Choose the answer which best completes the statement.

1. It is considered to be made up of only one firm or business.
    a. Industry
    b. Technology
    c. Enterprise
    d. Factory

2. An institution within society that develops and uses technology together with human and natural resources to develop, produce, distribute, and service something of value is called.
    a. Industry
    b. Technology
    c. Enterprise
    d. Factory

3. A collection of all the enterprises or businesses involved in making similar products or services is referred to as.
    a. An industry
    b. A technology
    c. An enterprise
    d. A factory

4. Individuals start enterprises to
    a. Make a profit
    b. Help people live better
    c. Both A and B
    d. None of the above

5. The process used to exchange ideas and information is
    a. Human Resources
    b. Production
    c. Maintenance and Service
    d. Communications

6. Which element of an enterprise makes the decisions and provides leadership for its operation?

   a. Communications
   b. Human Resources
   c. Management
   d. Research and Development

7. It is a procedure used in investigating ideas for the purpose of arriving at a solution to a need.

   a. Research and Development
   b. Production
   c. Marketing and Distribution
   d. Maintenance and Service

8. The actual repairing of property, equipment, and people is called?

   a. Research and Development
   b. Production
   c. Marketing and Distribution
   d. Maintenance and Service

9. The flow of goods and services from producers to consumers is called?

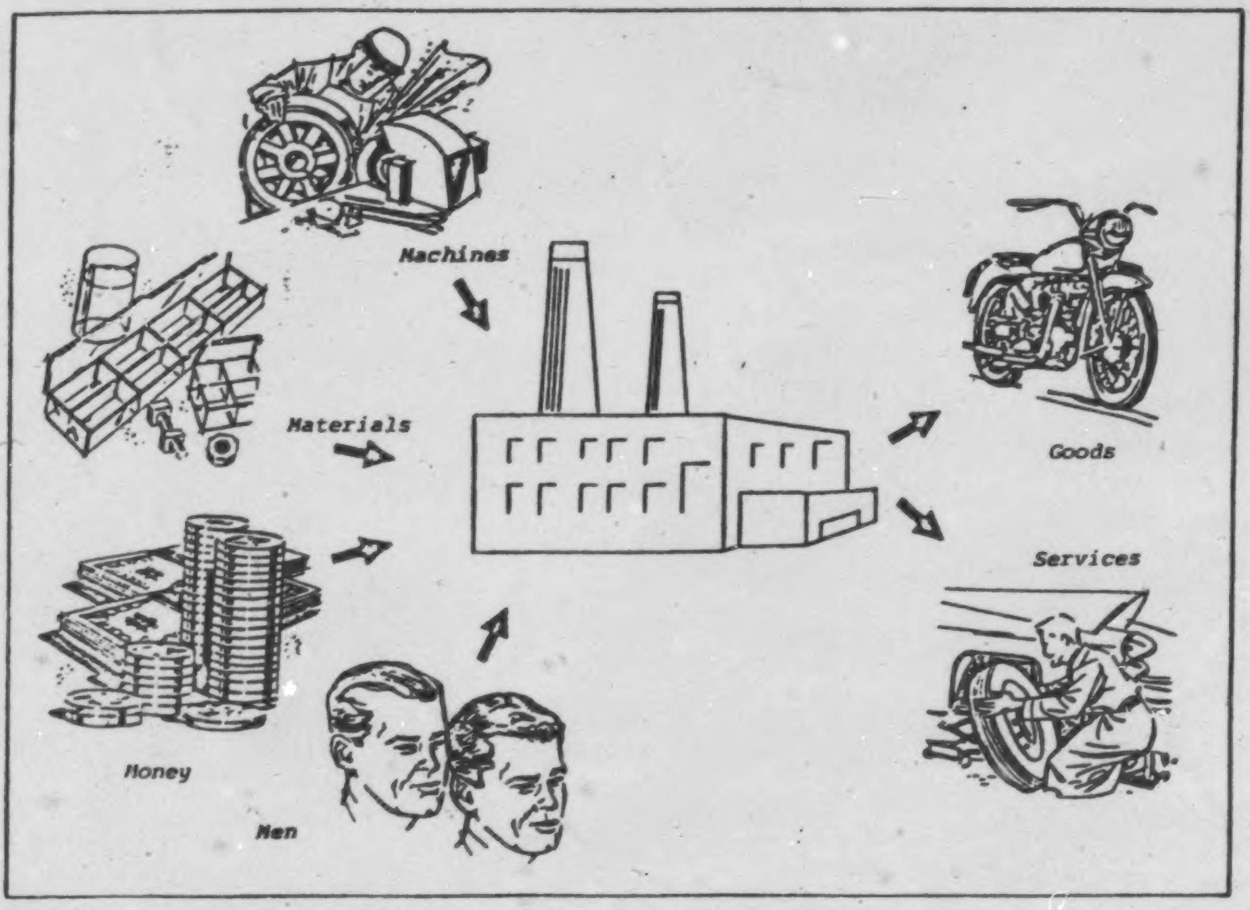
   a. Research and Development
   b. Production
   c. Marketing and Distribution
   d. Maintenance and Service

10. The methods and processes used in the output of goods and services is

   a. Research and Development
   b. Production
   c. Marketing and Distribution
   d. Maintenance and Service

AN AUDIO-VISUAL PRESENTATION

THE ENTERPRISE


Machines
Materials
Money
Men
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Prepared as an Aid in Implementing
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Audio Visual Presentation

Prepared as an aid in Implementing
The Wisconsin Guide to Local Curriculum
Improvement in Industrial Education K-12

This script should accompany the
film strip and cassette presentation entitled:

THE ENTERPRISE

Pertaining to Field Objective Number One

"To provide students the opportunity to work with the
eleven elements of industry to gain an understanding of how they
function in providing goods and services."

Produced by:

George Oles

in cooperation with

Instructional Technology Services

and

The Industrial Education Instructional
Materials Development Project

Both of the University of Wisconsin--Stout
Menomonie, Wisconsin

Project Director:

Lawrence S. Wright, Ed. D.

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Supported by:

The Wisconsin Department of Public Instruction

The Graduate College and the Center for Vocational,
Technical and Adult Education
Both of the University of Wisconsin--Stout

THE ENTERPRISE

Open on Black - Change slide when music begins.

Slide #1	When people first evolved on this earth, it was all they could do to clothe and feed themselves. They simply did not have time to think about producing an excess for profit.
Slide #2	Then fire was discovered. Early civilizations pushed back the darkness of night and began contemplating their existance. They found ways to make life easier, and were soon able to produce more than they needed, and they began trading products with neighboring villages. Thus, the beginnings of our modern enterprise system took place.
Slide #3	America depends on private enterprise for her survival.
Slide #4	Car dealerships offer a means of transportation
Slide #5	while shops provide handicrafts to feed our creative yearnings.
Slide #6	If its the stomach that needs feeding, there are thousands of food enterprises eager to serve you.
Slide #7	Glasses and sashes, cards, posters, candles and toasters; all this with ease; there when you please.
Slide #8	Regardless of the demand, there is a supplier trying to meet it.
Slide #9	Not every enterprise exists for profit.
Slide #10	Many provide necessary public services which help
Slide #11	solve social, medical and
Slide #12	security problems that affect all America.
Slide #13	When a demand exists, suppliers are trying to meet it. Often there are more suppliers than necessary, and the laws of survival
Slide #14	will determine who makes the profit,
Slide #15	and who does not.

Slide #16	A supplier wishing to survive has to make his or her product more desirable than the competitor's while maintaining competitive price differences.
Slide #17	Small businesses often deal over minor price differences to stay above the competition..
Slide #18	Some offer more leg room, others offer fast service,
Slide #19	while still others push charcoal broiled, super deluxe, all meat, special sauce, lettuce, cheese, pickles, onion, on a sesame seed . . . ah . . . well any way, the trick to staying on top is to keep moving.
Slide #20	Number two is always trying to take over the top of the mountain; but if number one can continue to move up, competition won't catch up.
Slide #21	Research and Development can make progress a reality. It keeps developing new methods to cut cost, speed production, and improve the product.
Slide #22	Everyone likes something New New New
Slide #23	New and meaty,
Slide #24	sweeter smelling, softer feeling,
Slide #25	brighter looking, better feeling, faster acting, more accurate,
Slide #26	easier to use. Remember, you can't sit and wait for Number two to catch up if you are going to continue to be Number one.
Slide #27	So far we have talked about enterprise, but what about industry. How does enterprise relate to industry. It is really very simple.
Slide #28	Industry is made up of many related enterprises. Coca Cola
Slide #29	and Seven Up are two enterprises in the carbonated beverage industry.
Slide #30	Another common example is the automobile industry. The parts that go into building an automobile come from enterprises.

Slide #31 Glass to make the windows . . .

Slide #32 plastic and vinyl for the interior . . .

Slide #33 chrome and steel . . . carpeting and upholstery . . .

Slide #34 radios and tires . . . all these parts are made by enterprises,

Slide #35 shipped to the factory, and manufactured into the automobile. The combination of all the companies providing parts, and assembling them into the automobile make up the Automotive Industry.

Slide #36 Chrysler, Ford,

Slide #37 American Motors and

Slide #38 General Motors are four big enterprises in the automotive industry.

Slide #39 Now that we know what an enterprise is, let's take a closer look at how it works. An enterprise is divided into 3 major elements.

Coordinating Elements
Resource Elements and
Systems Elements

Slide #40 Let us begin with coordinating elements, which consist of Management and Communications.

Slide #41 Management takes care of coordinating the activities within the company to assure smooth and accurate production of goods and services.

Slide #42 People in management make the decisions determining the goals of the company,

Slide #43 and how they are to be met.

Slide #44 The other major coordinating aspect of the enterprise is communications. The two kinds of communications in enterprise are internal and external communications.

Slide #45 Internal communications take place between individuals within the enterprise.

Slide #46 Police communicate through the use of a two-way radio;

Slide #47 others use telephones, office memos and dictation equipment.

Slide #48 External communications is the exchange of messages between an enterprise and elements outside the enterprise.

Slide #49 Advertising is the most common form of external communications. Companies advertise through the use of signs,

Slide #50 magazines and newspapers

Slide #51 with attention-getting photographs,

Slide #52 along with radio and television commercials designed to reach the mass communications audience.

Slide #53 Questions are often raised concerning the effectiveness of advertising. Many agree that sixty to seventy per cent of their advertising is useless. But what about the 30 to 40 per cent that is considered effective?

Slide #54 How are you affected by advertising? Have you ever bought a record album because of its cover photograph?

Slide #55 Now let's look at the resource elements of the enterprise. These are Finance, Human Resources, Property, Power and Energy, and Materials.

Slide #56 Finance is one of the most complex areas in business. Enterprises, particularly new or expanding companies, must obtain money to purchase materials and pay salaries. There are many ways a business can raise money, but we are concerned with the three major ones.

Slide #57 The most popular method of finance is the bank loan. Loans are for a fixed term, and don't require the company to sell part ownership in the business.

Slide #58 Another way of raising money is through the sale of stock in the company. Stock certificates represent part ownership in the

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Slide #59 The other method of fund raising is that of bond sales. Bonds are much like savings accounts. People believing the company is going to grow and continue to profit yearly,

Slide #60 will purchase bonds. A bond is a fixed term investment. Bonds will pay a high interest rate when held to maturity. For example a savings bond selling for $37.50, will provide the holder with $50 return when held for a 5 year period. The rate of interest will vary for each company.

Slide #61 Stocks and bonds do not guarantee a profit. If the company looses money, so do the investors.

Slide #62 The human resource element makes up the back bone of any company.

Slide #63 People working with machines and with other people control the

Slide #64 output of the enterprise. A company's greatest resource

Slide #65 is its personnel, and the demand for qualified individuals,

Slide #66 skilled in the elements of enterprise is one of the greatest needs facing industries today.

Slide #67 In times of high unemployment, the skilled worker is the person in demand. Will that individual be you?

Slide #68 There is no place like home . . . your own yard; your own property.

Slide #69 And property is a very necessary element of the enterprise. With today's high cost of transportation,

Slide #70 energy and natural resources, the location of any enterprise has become a vital key to success.

Slide #71 Where will your power and energy come from?

Slide #72 How much of your business' income will be spent on energy,

Slide #73 and will there be enough energy available to meet future needs?

Slide #74	Where are your raw materials coming from?
Slide #75	How much will they cost,
Slide #76	and where can you store them?
Slide #77	One thing is certain. This world is just so big, and the resources are limited. How long the resources last is a problem you, our future business people, will have to deal with every day. Think about it!
Slide #78	But what about the systems elements? Research and Development, Production, Marketing, Distribution, and Maintenance and Service.
Slide #79	Earlier we suggested the importance of Research and Development in identifying
Slide #80	new and better products that will help keep a company ahead of its competition.
Slide #81	The production elements of industry develop the assembly procedures for producing the product.
Slide #82	Engineers determine and specify the methods of assembly.
Slide #83	The production area is layed out, materials are ordered, special assembly equipment prepared,
Slide #84	a production schedule outlined, and a pilot run is made and analyzed.
Slide #85	Once the necessary adjustments are made, the plant begins full production to meet the demands of consumers.
Slide #86	The marketing department determines the number of units to be produced, and the kinds of products the consumer will buy.
Slide #87	Related to marketing is the distribution department. People working in distribution determine where the products are sent,
Slide #88	and how they will be transported.
Slide #89	All forms of transportation are used in delivering products to the consumer.

Slide #90 Once a product reaches its destination many companies guarantee quality performance, and offer services to maintain product performance in the field.

Slide #91 The phone company services our phones at no extra charge.

Slide #92 The Xerox people take good care of our copier, and the Coca Cola man keeps our machine full.

Slide #93 When you buy a new car, a service card is issued guaranteeing free service for a set period of time or mileage.

Slide #94 Quality service is a vital element of an enterprise. Companies must stand behind their products.

Slide #95 Now that you have learned about the elements of enterprise, how could you set up an enterprise in your school shop?

Slide #96 Your first task is to establish organizational roles. Determine who the company officers should be. You and your instructor can assume the role of the board of directors; the company officers can be elected from the class.

Slide #97 Once the officers have been selected, jobs must be assigned. All employees must be productive for a company to secure a profit. Refer to the enterprise network analysis chart to determine the tasks to be done.

Slide #98 Select the product to be produced,

Slide #99 and build a prototype.

Slide #100 Choose a simple product that you hope will sell. Remember your goal is to make a profit. Survey the market to determine whether the product will sell or not.

Slide #101 Have the engineering department from your enterprise make working drawings,

Slide #102 and design jigs and fixtures for producing the products as rapidly and efficiently as possible. You must obtain money for materials before any production can begin

Slide #103 Assign students to sell stock in the enterprise. Stocks must be liquidated at the end of the semester, and the profits must be divided equally among the share holders. Members of the enterprise can provide a sound financial foundation by buying shares in their own company.

Slide #104 Once the stock is sold you will have money for materials. By now the plant should be ready for a pilot run.

Slide #105 After the pilot run, correct any problems. When everything is ready, produce the number of products necessary to meet consumer demand.

Slide #106 Then package and sell the products.

Slide #107 After all the products have been sold, cover your costs, determine your profit margin, and then liquidate the company by distributing all the profits to the stock holders, and by buying back all outstanding stock.

Slide #108 We hope this has helped you understand the enterprise system, and we encourage you to try establishing an enterprise in your shop.

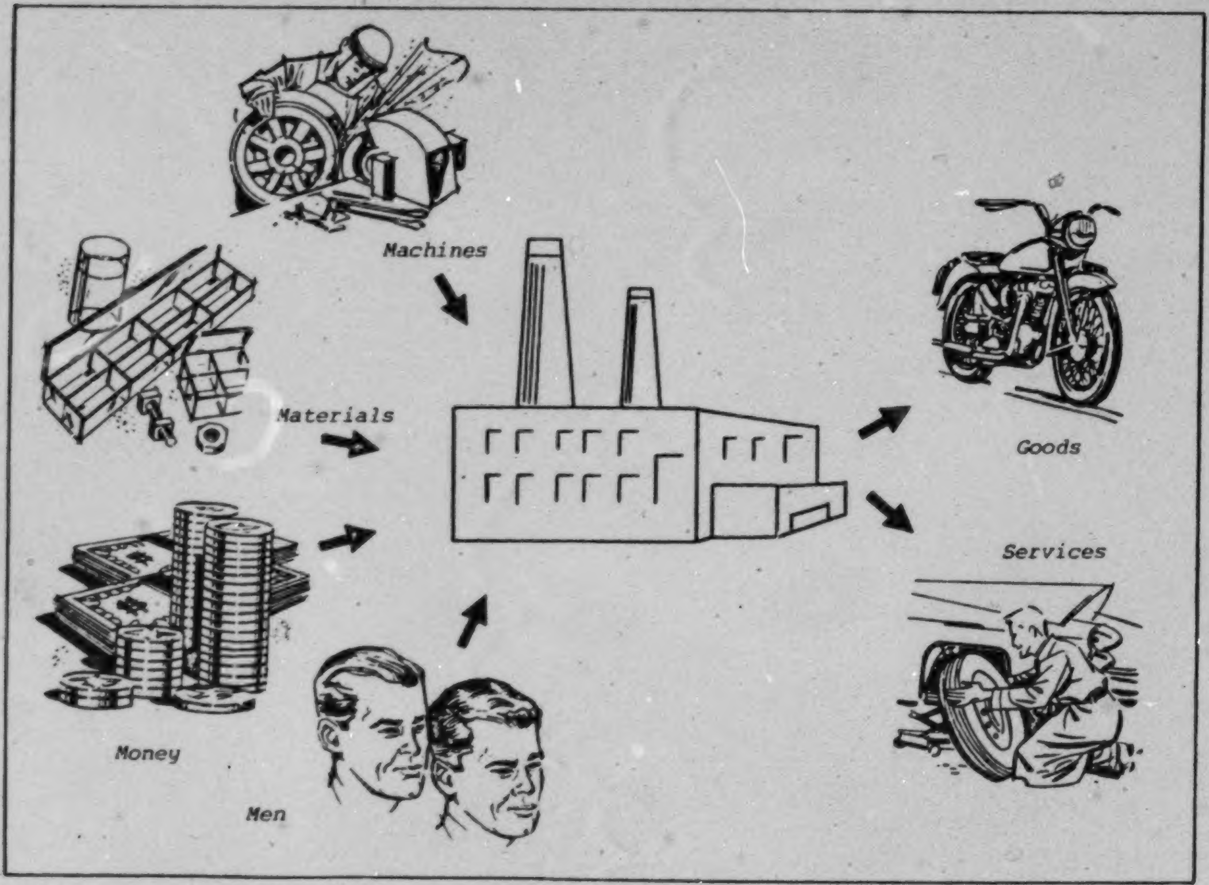
Slide #109 It will be fun and it represents the real world.

Slide #110 You may make a profit--or loose your shirt. We wish you the best of luck in your enterprise.

THE ENTERPRISE --

AN ALTERNATE DELIVERY SYSTEM

JUL 25 1975


Machines
Materials
Money
Men
Goods
Services

Prepared as an Aid in Implementing
The Wisconsin Guide to Local Curriculum
Improvement in Industrial Education, K-12

Learning Activity Package

Prepared as an aid in Implementing
The Wisconsin Guide to Local Curriculum
Improvement in Industrial Education K-12

THE ENTERPRISE

An Alternate Delivery System

Junior and Senior High School

Pertaining to Field Objective Number One

"To work with the elements of an enterprise
to gain understanding of how they function
in producing goods and services."

Produced by:

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Contributor to This Package:

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ALTERNATIVE MATERIALS

Teacher Information:

The following activities will probably work best in small groups. You might have more than one project operating at a time. Organize each group to set up an actual enterprise.

Some items to manufacture:

- Wire coat hangers
- Kites
- Pocket pennants for football or baseball
- Lawn mower clean up and check
- Bicycle clean and oil
- Waste basket basketball hoops
- Note card holders
- Small sheet metal projects

The following steps will help you organize your enterprise.

Step 1 Form the management levels.

Step 2 Discuss the idea--select product or service.

Step 3 Determine materials to be used.

Step 4 Seek orders--determine market.

Step 5 Determine amount of money required for costs.

Step 6 Organize the operations to be carried out.

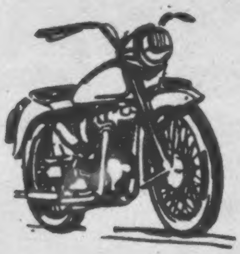
Step 7 Place to carry on enterprise.

Step 8 Methods of construction--power tools, hand operation.

Step 9 Organize the delivery of goods.

THE ENTERPRISE

IS IT a



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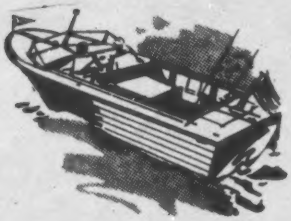

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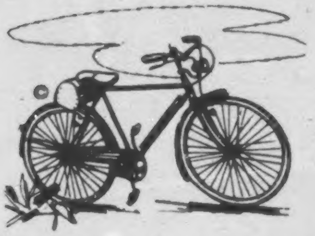
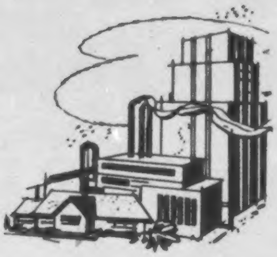


NO !!

What is it then?

IT IS AN



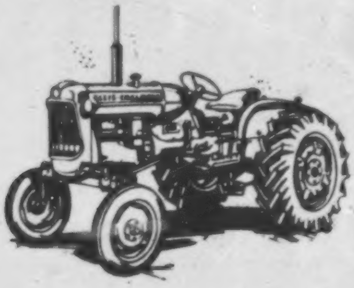
INDUSTRY

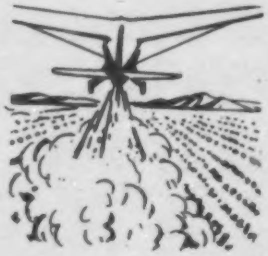
Let us investigate page two.

WHY STUDY "THE ENTERPRISE"?

Because our lives are so dependent on industry and its products; for example:

FOOD - to produce food we use:





TRACTORS INSECTICIDES - FERTILIZERS

ALL MADE BY INDUSTRIES.

CLOTHES

made in factory

AUTOMOBILE

made in factory

These are only a few--try thinking of every thing you own or use each day and ask yourself "Where did this come from?"

The more you understand about industry the better you will understand things in life.

What things do we depend on??

How important they are??

How does an enterprise function??

After you have completed this package you will have gained an understanding of how an enterprise functions in providing goods and services.

You should also seek to:

a. explain in your own words the difference between an enterprise and an industry

b. find two reasons why enterprises are established

c. gain knowledge of the enterprise so that you can list without references the eleven elements basic to the existence of an enterprise

d. be able to explain the function of each of the eleven elements

e. explain how you would start an enterprise at school

CHECK YOUR OPTIONS, PAGE 4

OPTIONS

IF you can answer the questions on page 6, do not read this package but . .

SEE your teacher for evaluation procedure.

IF you CANNOT answer any of the questions on page 6, PROCEED to PAGE 7.

IF you can answer some questions but not all, read only those sections you do not know.

You are NOT following instruction.

It is only wasting time looking at pages that do not concern you.

NOW TURN TO CORRECT PAGE

SELF-TEST

Answer all the following questions.

1. Explain in your own words the differences between an industry and an enterprise.

2. Write two (2) reasons why individuals establish an enterprise.

3. Make a list of the eleven (11) elements basic to the existence of an enterprise.

1.
2.
3.
4.
5.
6.

7.
8.
9.
10.
11.

4. Explain the function of each of the elements in Question 3.

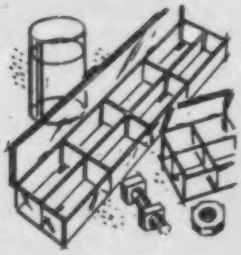
1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
11.

WHAT IS AN ENTERPRISE?

WELL!! It takes

people

money



materials

knowledge

to form an enterprise or business.

It consists of one business or firm, e.g. a candy shop; a retail store; a bus company; an automobile manufacturer.

SOME are BIG -- General Motors

SOME are SMALL -- The CANDY STORE

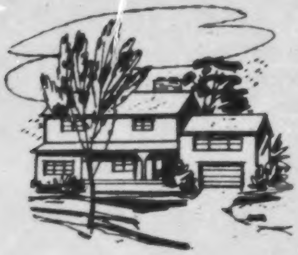
BUT WHY FORM AN ENTERPRISE? ANY IDEAS!!!

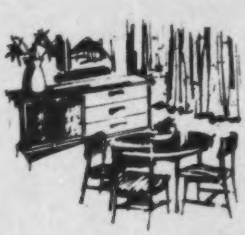
COMPARE YOUR IDEAS WITH THOSE ON PAGE 8 and 9.

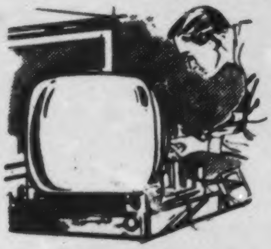
One reason for forming an Enterprise is to make a PROFIT.

BUT HOW?

ONE METHOD: MAKING THINGS TO SELL

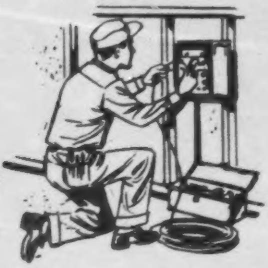


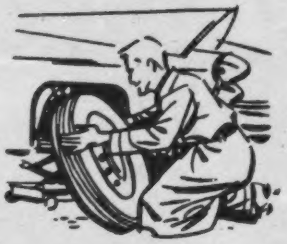




Add other items you can think of.

A SECOND METHOD: BY PROVIDING A SERVICE





Add more to this list.

A second reason for forming an Enterprise is to HELP PEOPLE.

Sometimes we forget that everything is not for money.

What enterprise does not exist simply to make a profit?

Surprisingly there are some:

RED CROSS

SALVATION ARMY

HOSPITALS

SOCIAL WELFARE AGENCY

I'm puzzled?

I always thought General Motors was an industry.

WELL, YOU'RE PARTLY RIGHT!!

It really is PART of an industry.

The INDUSTRY consists of all the enterprises.

American Motors AMC

Ford

General Motors GMC

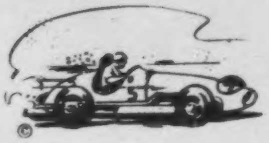
Chrysler Corporation CHRYSLER

These form the

AMERICAN AUTOMOBILE INDUSTRY

WHAT ABOUT TECH . . er . . TECHNOL . . er

TECHNOLOGY



INDUSTRIES use "TECHNOLOGY"

DOES THAT MEAN ENTERPRISES USE TECHNOLOGY?

YES!

However . . . some industries use technology more than others and in general more is used for manufacturing than for maintenance and services.

Example -- The aircraft industry uses the most modern technology available in manufacturing airplanes.

BUT

A home plumbing repair enterprise has no use for other than traditional skills and tools.

TRY PAGE 12

Did you find out what TECHNOLOGY IS???

YOU DID!!

GOOD FOR YOU!

If you'd like to find more information, look at page 61 of the AMERICAN INDUSTRY STUDENT BOOKLET, Number 2. You're sure to find it interesting.

SO IS PAGE 13 OF THIS PACKAGE

Let's take a look!!!

THIS TABLE IS NOT COMPLETE.

FILL IN AS MANY NAMES AS YOU CAN.

INDUSTRY	ENTERPRISE OR BUSINESS
AMERICAN __________ INDUSTRY	BOEING DOUGLAS CESSNA

If you are having difficulty, here is an easier one.

INDUSTRY	ENTERPRISE OR BUSINESS
AMERICAN __________ INDUSTRY	EDSEL AVANTI CORVETTE VALIANT

CHECK ON PAGE 14

CONGRATULATIONS . . . if you have more names than I have.

INDUSTRY	ENTERPRISE OR BUSINESS
AMERICAN AIRCRAFT INDUSTRY 	BOEING DOUGLAS LOCKHEAD NORTHRUP CESSNA BEECHCRAFT PIPER LEAR AERO COMMANDER

INDUSTRY	ENTERPRISE OR BUSINESS	
AMERICAN AUTOMOBILE INDUSTRY 	EDSEL AVANTI CORVETTE VALIANT FORD CHEVROLET PLYMOUTH DODGE VEGA PINTO HUDSON NASH	GRAHAM-PAIGE FRASER STANLEY WHITE CADILLAC RAMBLER BUICK OLDSMOBILE PONTIAC

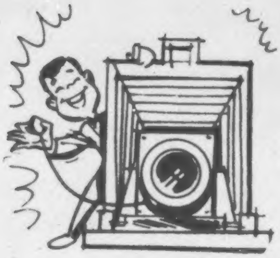
Did you get more names in the second list????

GO ON TO PAGE 15

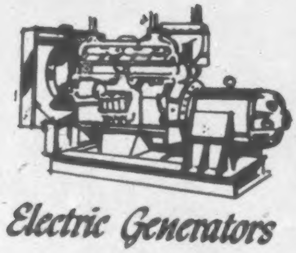
WHAT ARE THE PARTS OF AN ENTERPRISE?

THERE are 3 sections:

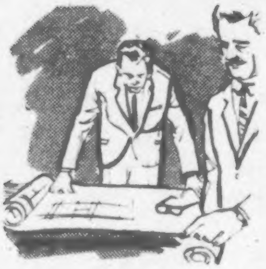
CO-ORDINATING ELEMENTS



RESOURCE ELEMENTS


Electric Generators

SYSTEMS ELEMENTS



Select your option on Page 16.

CO-ORDINATING ELEMENTS

consist of:

(a) MANAGEMENT

(b) COMMUNICATIONS

If you know about (a) and (b), go to page 21.

For more about (a) go to page 17.
(b) go to page 18.

MANAGEMENT

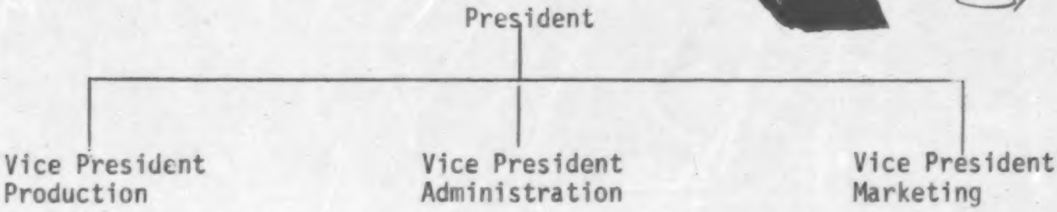
When one or two people set up an enterprise they usually share the management between them.

BUT!

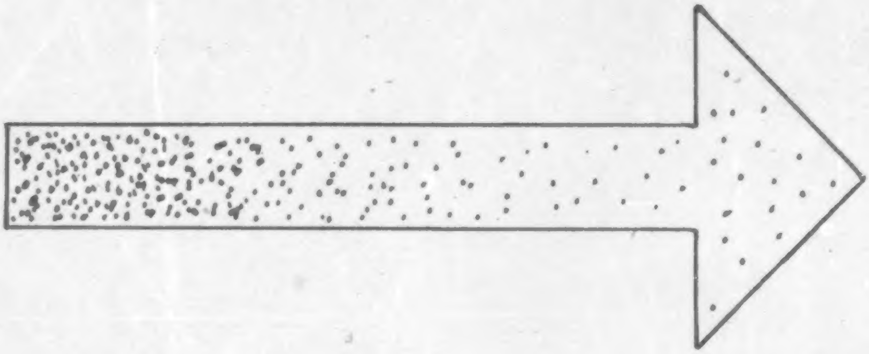
when a larger group wants to start an enterprise they usually appoint people to;

make decisions and be responsible for the success or failure of the enterprise.

Some positions could be:


President
Vice President Production
Vice President Administration
Vice President Marketing

If you would like to know more proceed to COMMUNICATIONS, page 18.



COMMUNICATIONS

Communication takes place when people exchange thoughts or ideas.

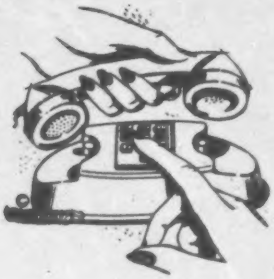
Talking

Writing letters

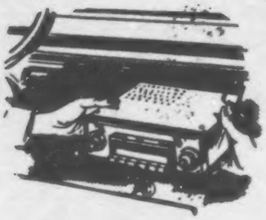
Pictures

Are all methods of communicating.

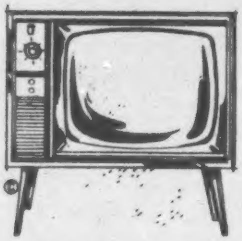
Do you think



TELEPHONE



RADIO



TELEVISION

are methods of communication???

My communication to you is

TURN TO PAGE 19.

If you think television, radio and telephone are methods of communicating . . .

YOU'RE RIGHT!!!

How many more methods can you name??

(1)

(2)

(3)

(4)

(5)

(6)

(7)

(8)

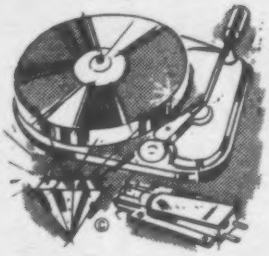
(9)

(10)

TURN TO PAGE 20 when you are finished.

Did you include any of these?

- Talking and listening
- Tape recorders
- Record players
- Code
- Books
- Charts
- Magazines
- Signs
- Newspapers



THINK ABOUT THIS

If there are no communications, how do you know what is happening.

Do you want to read more?? Try the learning package on COMMUNICATIONS, American Industry Student Booklet.

NEXT COMMUNICATIONS, PAGE 21

NOW CHECK YOURSELF . . .

to see if you understand the information.

1. What two elements are known as the co-ordinating elements of an enterprise.

   (a)

   (b)

2. Give two reasons why there is a management for an enterprise.

   (a)

   (b)

3. What is communications?

4. Name four ways in which people communicate.

   (a)

   (b)

   (c)

   (d)

Check page 22 and see if you agree with the Communication.

Your answers . . . should be similar to these.

1. a. management

   b. communications

2. a. to make decisions regarding the enterprise

   b. to accept responsiblity for the organizing of the enterprise

3. Communications take place so that people can exchange thoughts, ideas

4. a. talking

   b. television

   c. radio

   d. newspaper

   e. printing

   f. books

   There are a lot of answers for question 4.

IF YOU HAVE THESE ANSWERS CORRECT, GO TO PAGE 23.

IF YOU HAVE SOME ANSWERS WRONG, RETURN TO PAGE 17 MANAGEMENT or
PAGE 18 COMMUNICATIONS

RESOURCE ELEMENTS

FINANCE PAGE 24

HUMAN RESOURCES PAGE 25

PROPERTY PAGE 26

POWER and ENERGY PAGE 27

MATERIALS PAGE 28

If you have previously learned about any of the resource elements and can remember what you learned, there is no need to repeat that section.

If you know it all, turn to page 30 and check yourself.

If you are not sure, let's start on page 24.

FINANCE

This involves the securing of sufficient money to start an enterprise.

Why do you need money??

To get a building

To pay workers until the business starts to make a profit

To buy materials to work with

To buy tools

To buy equipment

WHERE CAN YOU GET MONEY???

SEE PAGE 25

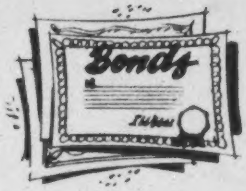
Money can be borrowed

WHERE?

- a loan

from a bank or finance company

- selling bonds



pay a fixed rate of interest - e.g., 10%

- selling stock

buy shares in the business and share in the profits at the end of the trading year.

This is getting interesting!!!

LET'S TURN TO PAGE 26.

HUMAN RESOURCES

THAT IS A FUNNY TERM

What does it mean?

It refers to people who are involved in the workings of an enterprise.

laborers

secretaries

bookkeepers

salesmen and

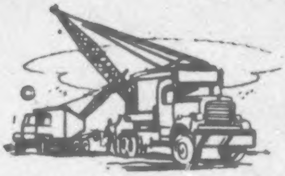
many, many more people

PROPERTY

This refers to:

the buildings,

the machinery,



the tools and equipment.

Power Tools

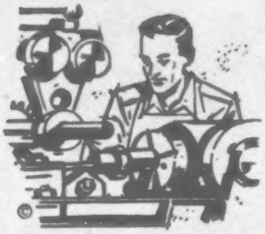
Most enterprises need to have some or all of these things so that they can function effectively. They are also called the company's assets!!

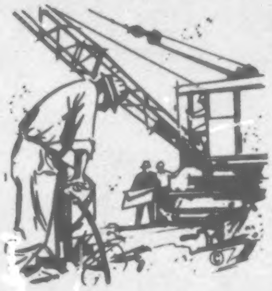
Move to page 28.

POWER AND ENERGY

If we are going to have machines, then what makes them work?

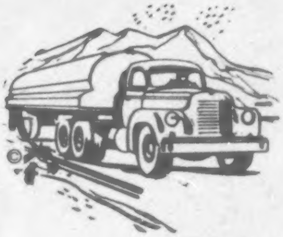
The two fundamental resources of power would be electricity and muscle power.

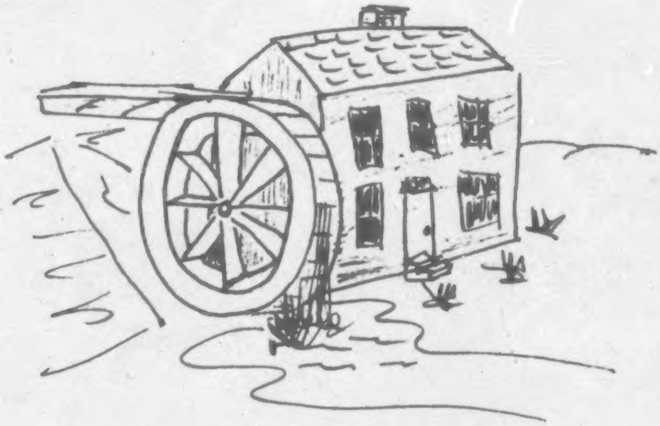


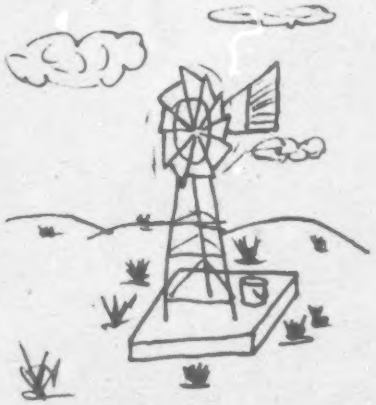


There would, of course, be some machinery driven by gas or diesel power.

At one time people depended on wind and water power to drive their machines.







MATERIALS

These are what an enterprise uses in making its product

OR

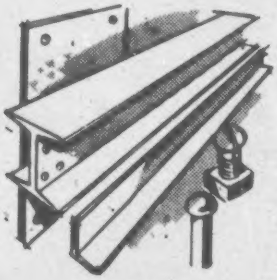
the raw materials used to make that article.

e.g. Building a car body --

material--sheet steel or now perhaps fiberglass or aluminum

or making wooden, spring clothespins

materials--wood, metal springs



Turn to page 30 for a quick check.

Check your knowledge.

1. Finance, Human Resources, Property, Power and Energy and Materials are known as which elements.

2. What is finance?

3. Why is finance necessary?

4. What part does human resources play in an enterprise?

5. What is property?

6. Why are power and energy important?

7. What is meant by materials?

Compare your answers on page 31.

Your answers . . . should be similar to these.

1. RESOURCE elements.
2. Finance involves the securing of money by borrowing, the recording of its use and the control of it.
3. To buy materials, equipment and pay salaries until the business makes a profit.
4. The people who work at making the enterprise successful form the human resources.
5. This refers to buildings, tools and equipment used by the enterprise.
6. Because they operate the tools of the enterprise.
7. These are the substances used by the enterprise in producing their product.

All correct--very good-go to page 32. Recheck any you don't feel sure about on page 24. Further readings --

AMERICAN INDUSTRY PROJECT STUDENT BOOKLETS

SYSTEMS ELEMENTS

Consists of:

RESEARCH and DEVELOPMENT PAGE 33

PRODUCTION PAGE 34

MARKETING and DISTRIBUTION PAGE 35

MAINTENANCE and SERVICE PAGE 36

If you have previously learned any of the above, there is no need to reread that one if you do not wish to do so.

Pick your appropriate starting point.

If you know all the terms, GO TO PAGE 37.

If you wish to read them all, START AT PAGE 33.

RESEARCH and DEVELOPMENT

An interesting topic!

What does it mean?

It refers to inquiring or experimenting to determine the best (most efficient) method and materials to produce a product.

It is like problem solving.

Yes! that is right but it involves what we call the "SCIENTIFIC METHOD".

ie. it follows a strict procedure which has been developed over the past few hundred years.

IT IS NOT GUESSWORK.

TURN TO PAGE 34.

REFERENCE: You can read more in the booklet, "AN INTRODUCTION TO RESEARCH AND DEVELOPMENT", Page 5-8.

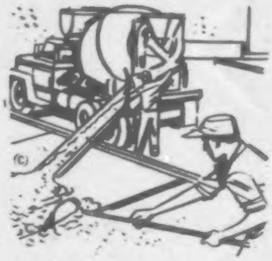
PRODUCTION

Is where the actual making or processing of goods or service is carried out.

The researcher finds the best materials and arrangement of those materials.

AND

PRODUCTION then finds the most efficient methods of making the article using the materials that the research identified.



MARKETING and DISTRIBUTION

The products have to be taken to the markets.

1. Where the market is must be known.
2. How is a market established?

Usually publicity and surveys are used to locate, establish and maintain a market.

How do the goods get to the market?

A transport system is necessary.

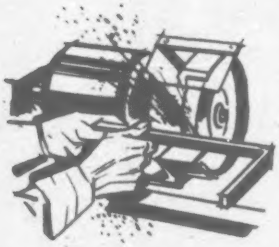
Delivery
Service

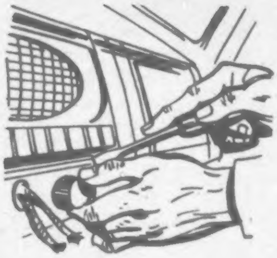
MAINTENANCE and SERVICE

Even though PRODUCTION does have an inspection system to try to eliminate bad quality articles, errors are made and the products can require adjustments and repairs.

If people cannot keep their products in a usable condition, they will buy others that can be repaired.

It is important that an enterprise should provide maintenance and service.





CHECK YOURSELF

1. What elements of an enterprise are known as the SYSTEMS ELEMENTS?

2. Explain what you understand of each of the elements which form the SYSTEMS ELEMENTS.

Check answers on page 38.

Your answers . . . should be similar to these.

1. a. Research and Development
   b. Production
   c. Marketing and Distribution
   d. Maintenance and Service

2. a. Research and Development is the determining of the best types of materials to be used.
   b. Production is developing a system to make the article based on the materials determined by research.
   c. Marketing and Distribution is involved in getting the product from the enterprise to the people who want to buy it.
   d. Maintenance and Service deals with adjustments and repairs to the product after it has been purchased.

ARE YOU READY TO START YOUR OWN ENTERPRISE??

Let's review what you will NEED!

1. Do you know the difference between industry and enterprise?

2. Can you name an industry and some of its enterprises?

3. What are the eleven elements of an enterprise and their functions?

    1.
    2.
    3.
    4.
    5.
    6.
    7.
    8.
    9.
    10.
    11.

4. Can you list the three parts of an enterprise? (Hint: The elements you listed in Question 3 fall into one of the three parts).

If you are not sure about any of the answers, you should review those questions before you start your enterprise!

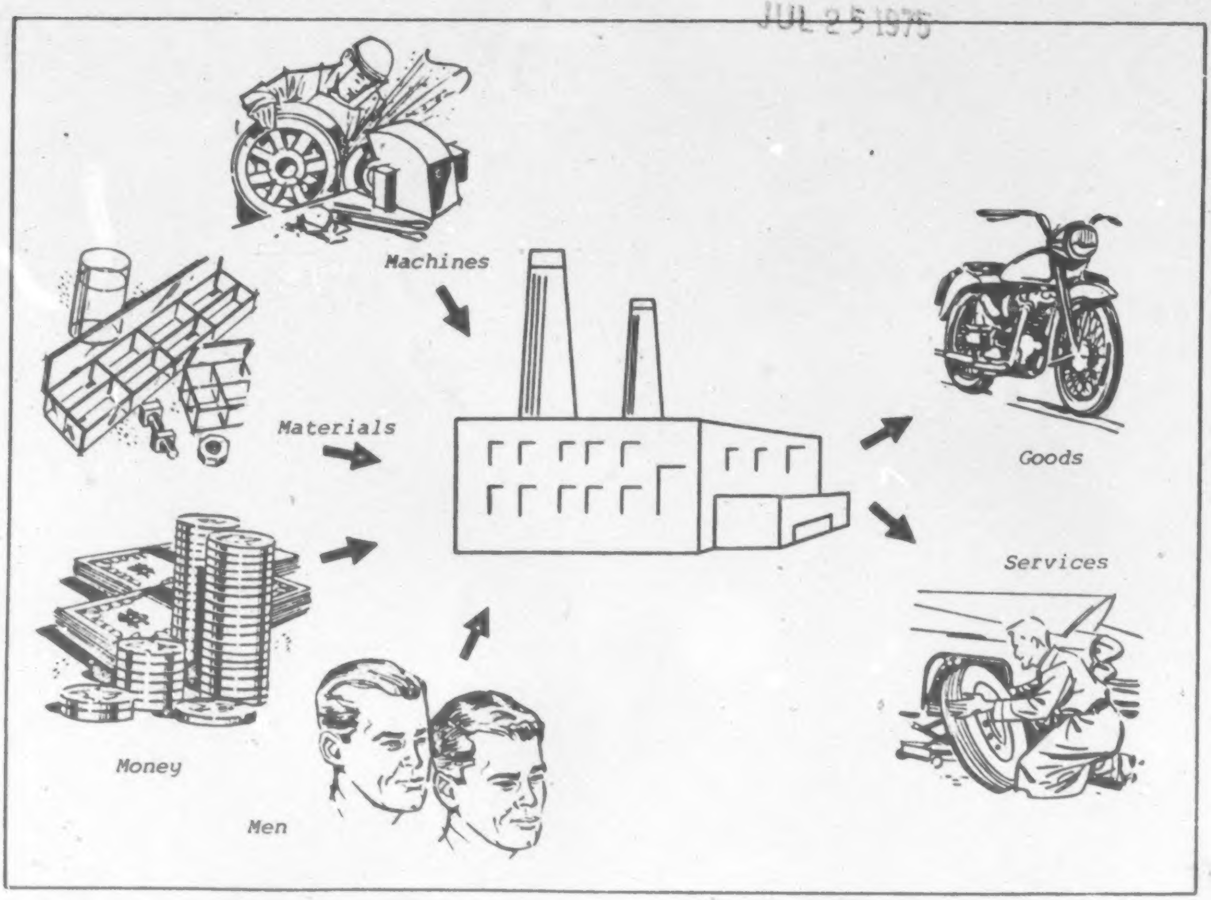
If you have answered every thing correctly, you are ready to begin.

GOOD LUCK!

TRANSPARENCY LAYOUTS

ELEMENTS OF INDUSTRY

JUL 25 1975


Machines
Materials
Money
Men
Goods
Services

Prepared as an Aid in Implementing
The Wisconsin Guide to Local Curriculum
Improvement in Industrial Education, K-12

Transparency Layouts

ELEMENTS OF INDUSTRY

Prepared as an aid in Implementing
The Wisconsin Guide to Local Curriculum
Improvement in Industrial Education K-12

May be used in the development of
overhead transparencies.

Pertaining to the 11 Elements of Industry:

Research and Development   Production   Marketing and Distribution
Maintenance and Services   Finance   Human Resources   Materials
Power and Energy   Property   Management   Communications

Produced by:

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TABLE OF CONTENTS

	Page
Research and Development	1
Production	5
Marketing and Distribution	9
Maintenance and Services	12
Finance	17
Human Resources	22
Materials	26
Power and Energy	31
Property	35
Management	39
Communications	44

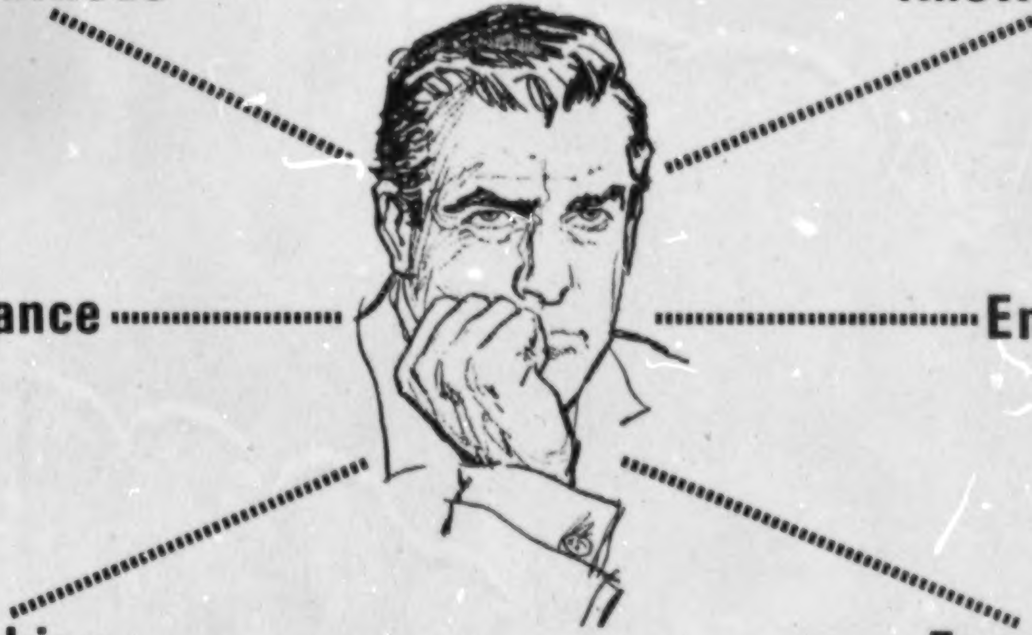
ROLE OF RESEARCH AND DEVELOPMENT IN INDUSTRY

To find a solution to a human need
that can be sold at a profit.

FIVE - STEP PLAN FOR GUIDING RESEARCH AND DEVELOPMENT

5. Take action
4. Test the solution
3. Find a solution
2. Assemble the facts
1. State the need

SIX TRAITS OF A CREATIVE THINKER



Ambitious

Knowledge

Perseverance

Enthusiasm

Thinking

Energy

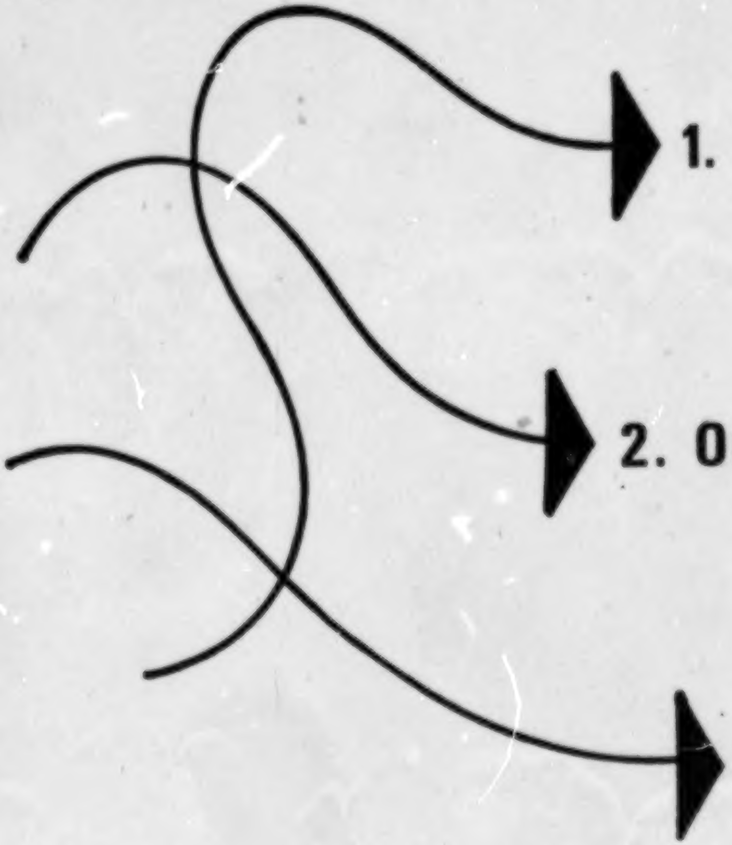
RESEARCH AND DEVELOPMENT

The investigation and experimentation conducted for the purpose of arriving at a solution to an identifiable need.

PRODUCTION TECHNOLOGY

The knowledge of efficient production practices.

3 BASIC OPERATIONS IN PRODUCING GOODS



1. Plan layout of factory and product.
2. Organize steps of production.
3. Control production process.

AREAS OF PRODUCTION PRACTICES

Pre-processing	Concerned with moving materials.
Processing	Materials are changed in their form.
Post-processing	Products are installed, maintained, repaired, and altered.

STAGES OF PRODUCTION

1. Preparing raw materials
2. Making industrial materials
3. Making components
4. Combining components
5. Preparing final product

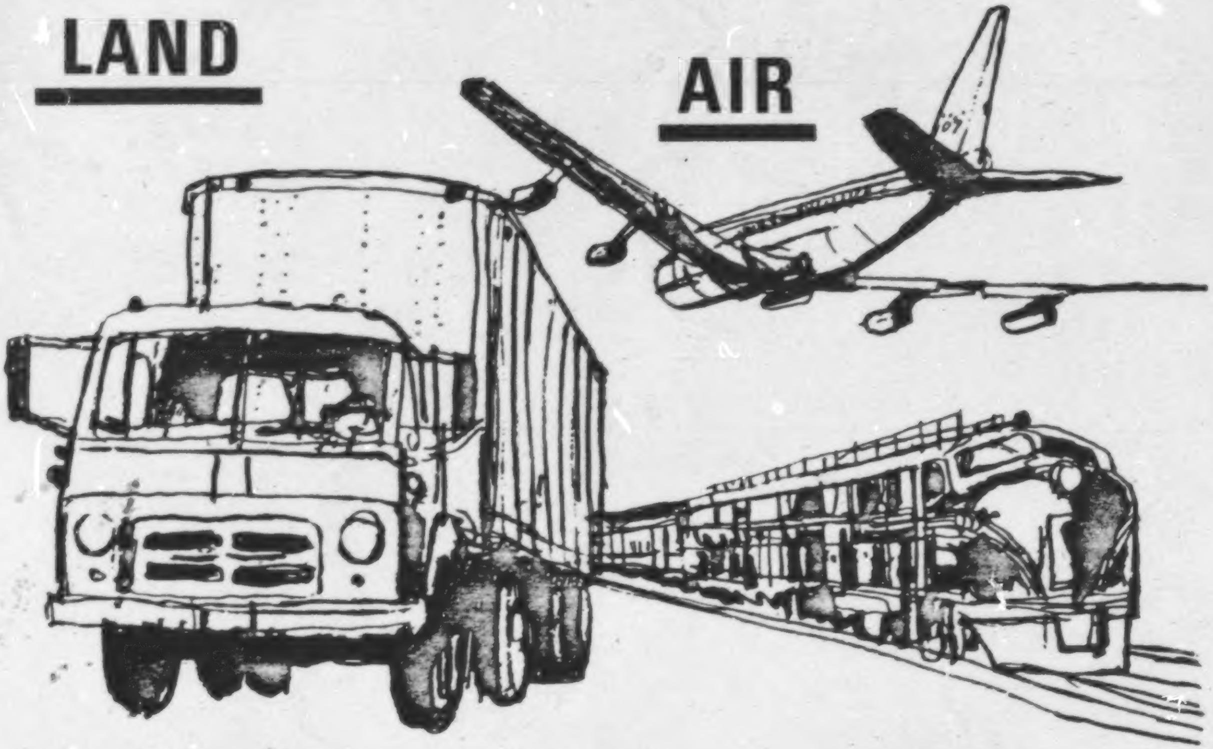
MARKETING AND DISTRIBUTION

The terms used by industry to describe the flow of goods and services from producers to consumers.

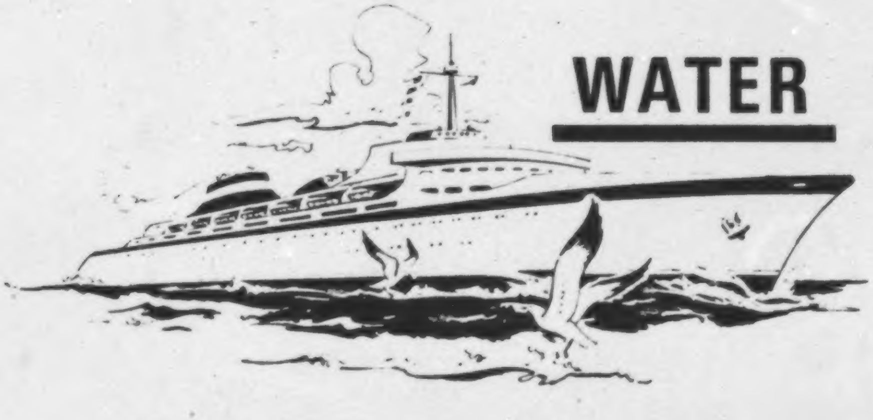
TYPES OF TRANSPORTATION

LAND

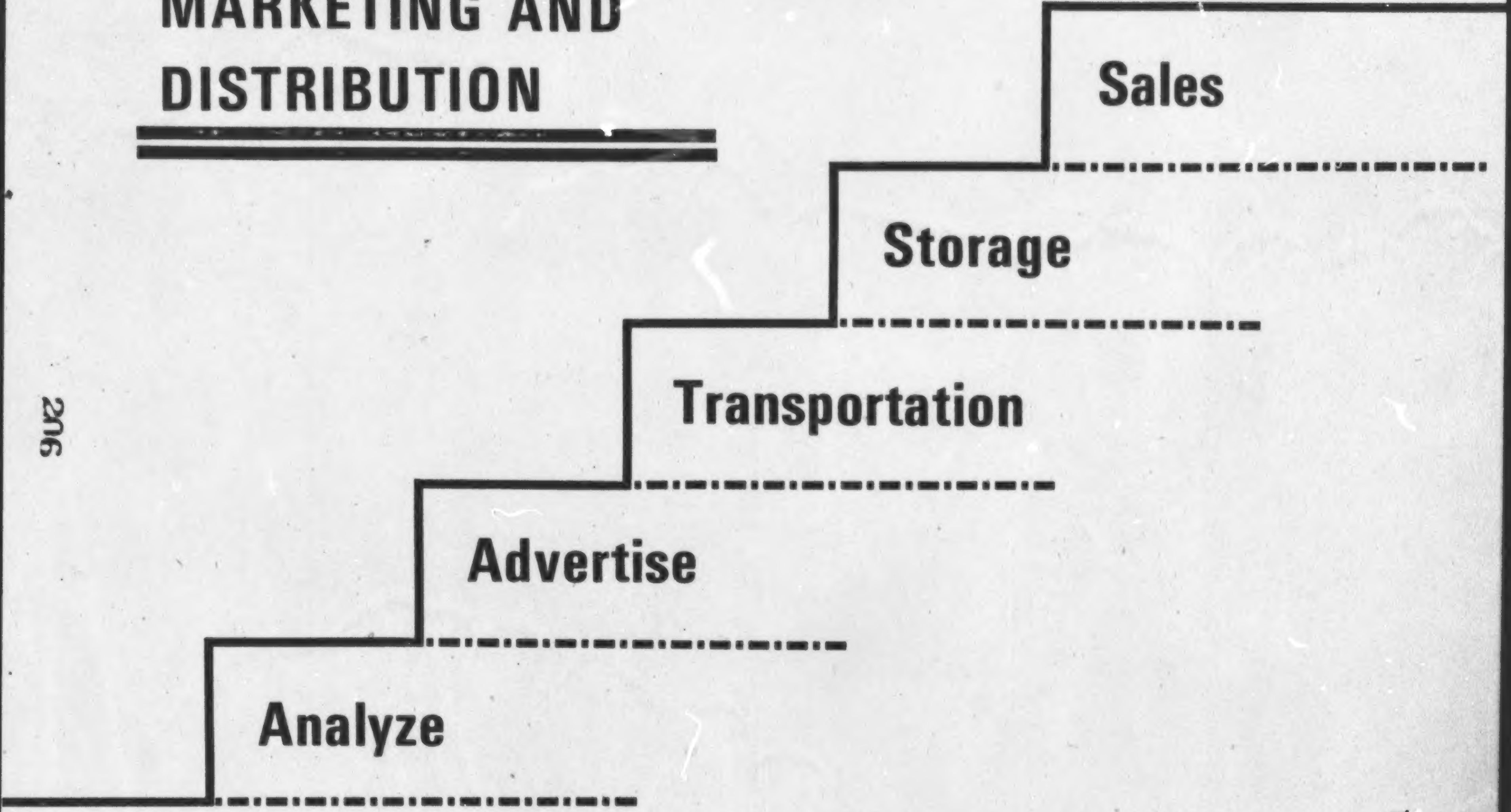
AIR



WATER



STEPS INVOLVED IN MARKETING AND DISTRIBUTION



Sales

Storage

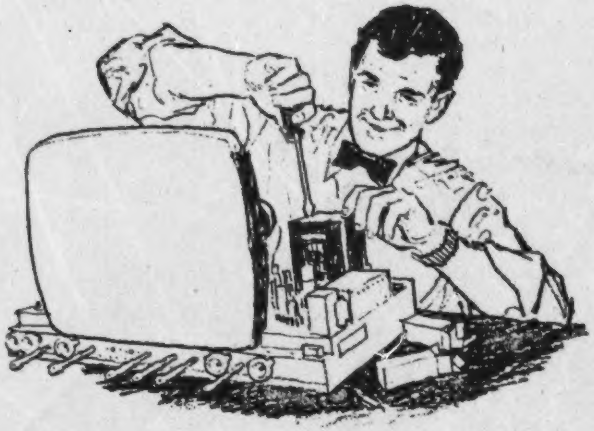
Transportation

Advertise

Analyze

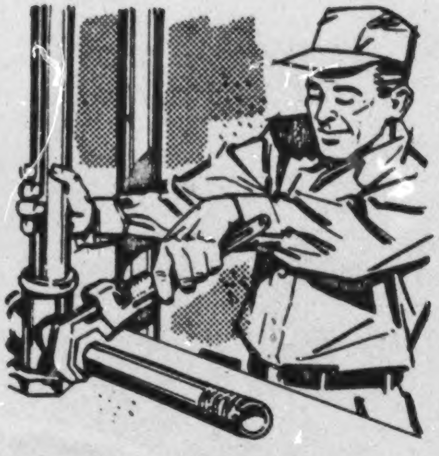
PRODUCT MAINTENANCE

Maintenance performed on the product after it has been bought and used by someone.



PLANT MAINTENANCE

Maintenance performed on the facilities of the plant



IMPORTANCE OF PLANT MAINTENANCE

To prevent loss of machine output.

To prevent paying non-producing workers.

MAINTENANCE FACTORS TO CONSIDER

① The amount of maintenance the product will require throughout its useful life.

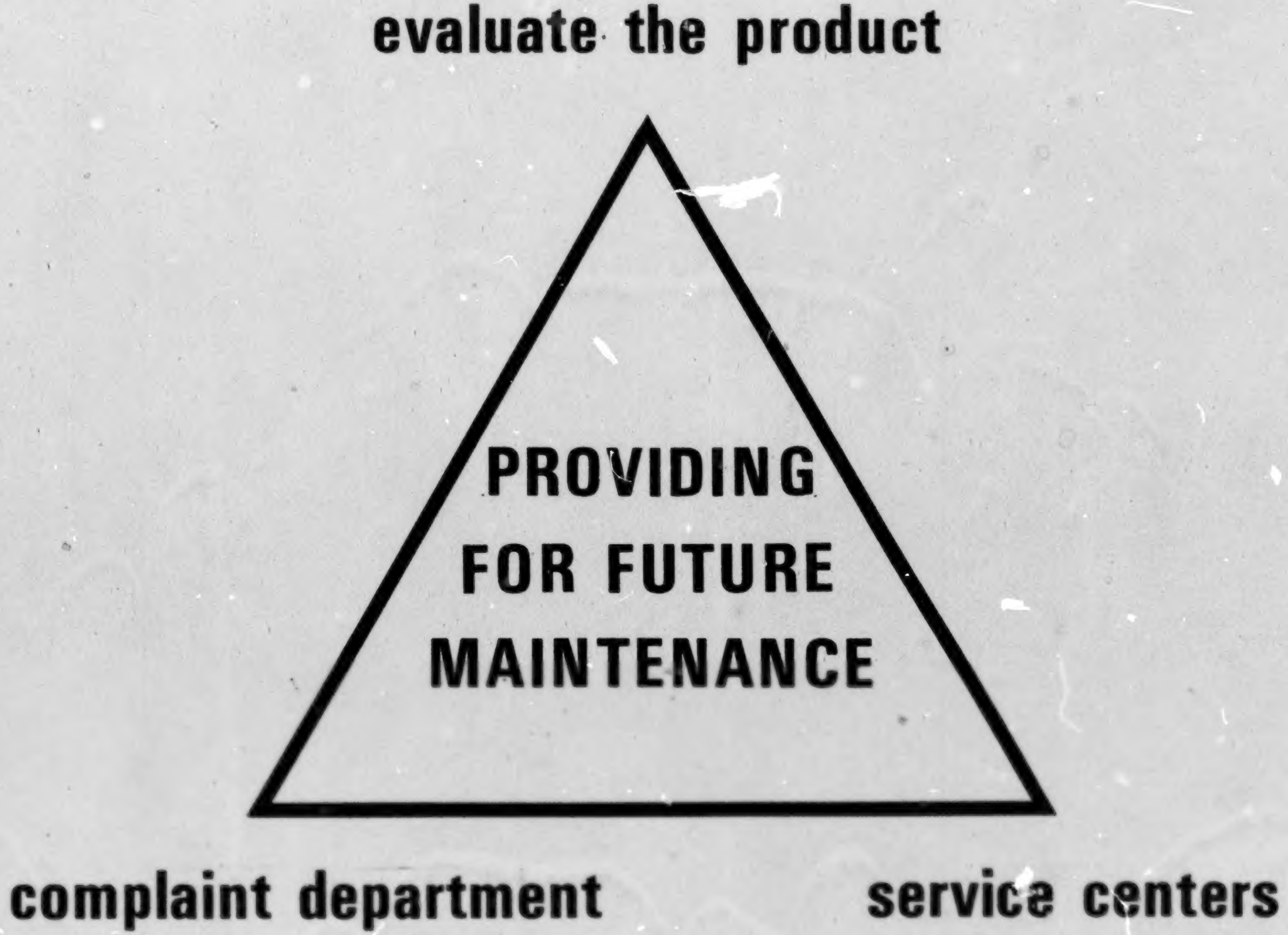
② The allowances made for future maintenance.

KINDS OF PLANT MAINTENANCE

Emergency repair

Routine repair

Preventative maintenance



evaluate the product

PROVIDING
FOR FUTURE
MAINTENANCE

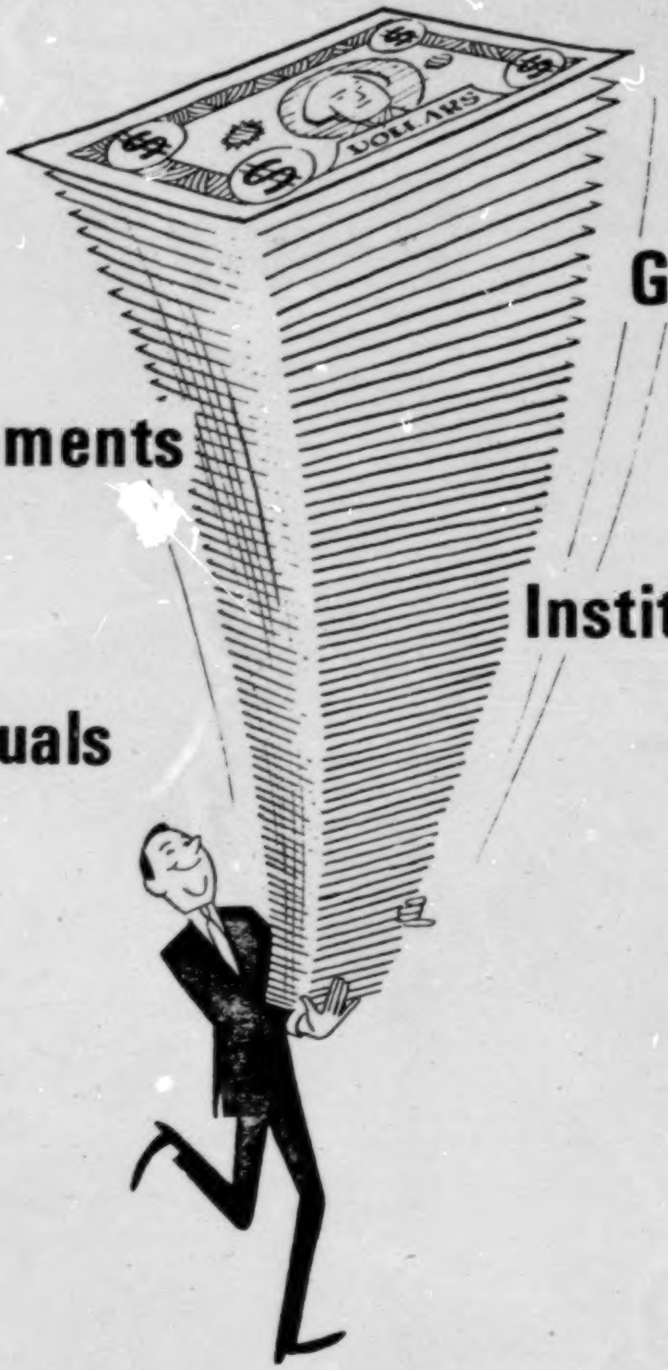
complaint department

service centers

WHAT IS FINANCE?

Finance is the process of obtaining and controlling money needed to develop and maintain an enterprise.

SOURCES OF FINANCIAL SUPPORT USED BY INDUSTRY



Groups

Governments

Institututions

Individuals

KINDS OF FINANCIAL SUPPORT

- Stocks
- Bonds
- Loans
- Subsidies
- Grants

DON'TS OF BORROWING MONEY

1. Don't borrow money unless really needed.

2. Don't borrow money until you have repayment plans .

3. Don't borrow money unless having it is worth what it costs.

4. Don't borrow money from an unreliable or unlicensed lender.

DO'S OF BORROWING MONEY

1. Do see lender's license.

2. Do obtain statement on repayment procedure and service charge.

3. Do insist on provisions for reduced service charges in case of early repayment.

4. Do examine terms of contract.

5. Do spend your credit carefully.

HUMAN RESOURCES

Human resources or manpower are people.
People that work together to make industry function.

SOURCES OF HUMAN RESOURCES

Employment agencies

Apprenticeship programs

Schools

KINDS OF HUMAN RESOURCES

Highly skilled

Skilled

Semiskilled

Unskilled

CHARACTERISTICS OF JOBS

Life style expectations.

Duration of employment.

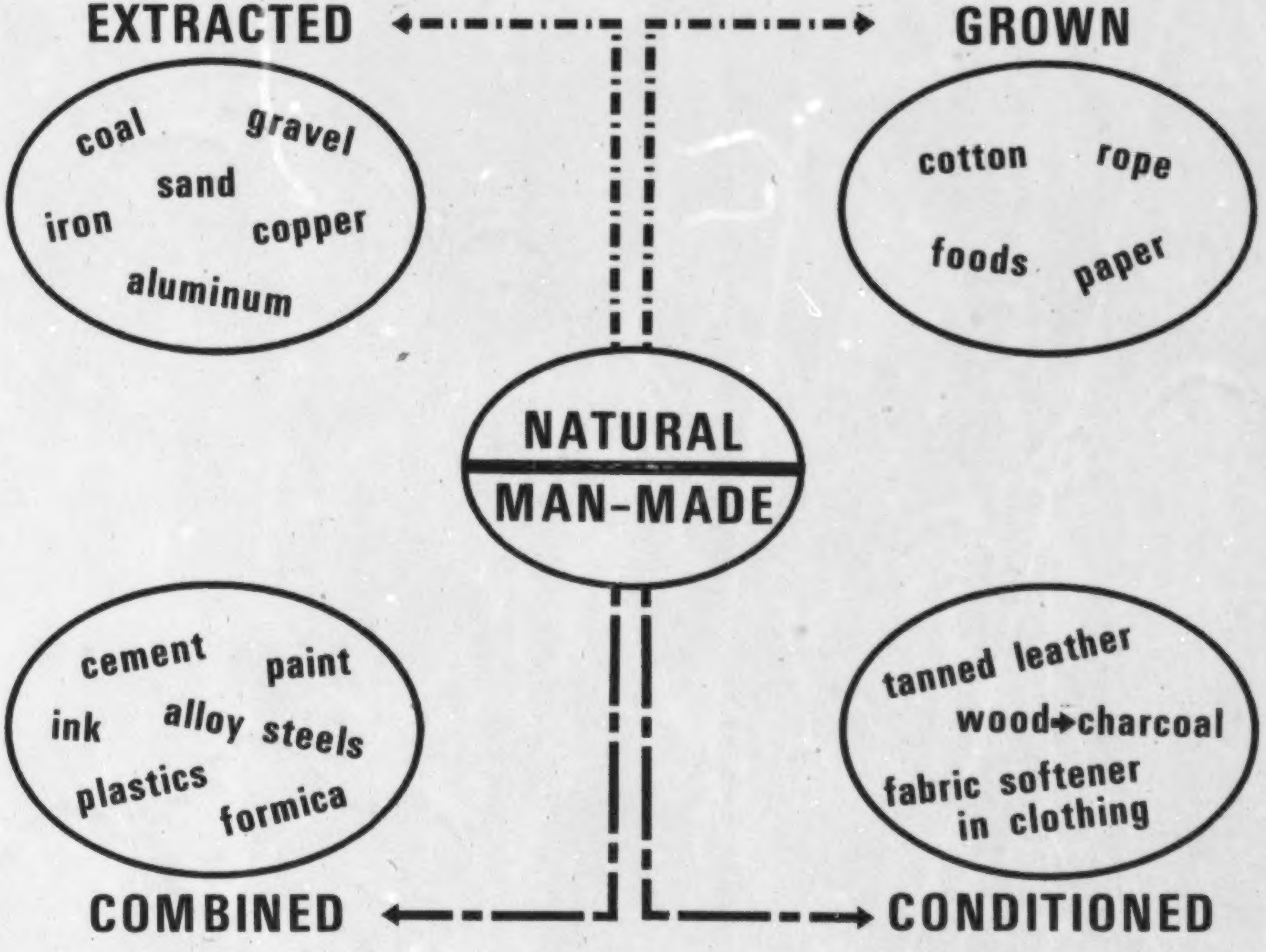
Commitment to the job.

Extent of responsibility.

MATERIALS

Substances from which products are produced.

SOURCES OF MATERIALS



EXTRACTED

coal
gravel
sand
iron
copper
aluminum

GROWN

cotton
rope
foods
paper

NATURAL

MAN-MADE

cement
paint
ink
alloy steels
plastics
formica

COMBINED

tanned leather
wood→charcoal
fabric softener in clothing

CONDITIONED

CONSIDERATIONS IN CHOOSING MATERIALS

How is the material composed?

How easily can the material be processed?

How available is the material?

What will the expense be?

What does the material look and feel like?

Will the material do the job?

COMPOSITION PROPERTIES

Physical

Thermal

Chemical

Electrical

MATERIAL FAILURES

TENSION – Resistance to being pulled apart.

COMPRESSION – Resistance to being squeezed.

SHEAR – Resistance to fail or break under opposite loads – tending to slide by each other.

TORSION – Resistance to a twisting force .

POWER AND ENERGY

The fundamental part in all mechanical and technological development which may be changed into work.

ENERGY

A substance or ingredient which has the ability to do work, but will not do work unless it is acted upon to produce power.

POWER

A force which can be exerted by energy if it is harnessed (confined) and controlled.

ENERGY

A substance or ingredient which has the ability to do work, but will not do work unless it is acted upon to produce power.

POWER

A force which can be exerted by energy if it is harnessed (confined) and controlled.

SOURCES OF ENERGY

Continuous supplies	wind water sun
Exhaustible supplies	oil coal chemicals uranium
Replenishable supplies	muscle energy timber

KINDS OF ENERGY

- Mechanical
- Natural
- Chemical
- Atomic
- Heat

REAL & INTANGIBLE PROPERTY

Real

Physical in nature.

buildings
materials
land
equipment

Intangible

In the form of paper or estimates.

stocks
money
patents
goodwill
deeds
bonds
copyrights

KINDS OF PROPERTY

Equipment

Buildings

Materials

Land

Patents

Rights

Capitol

SOURCES OF PROPERTY

Purchased

Inherited

Granted

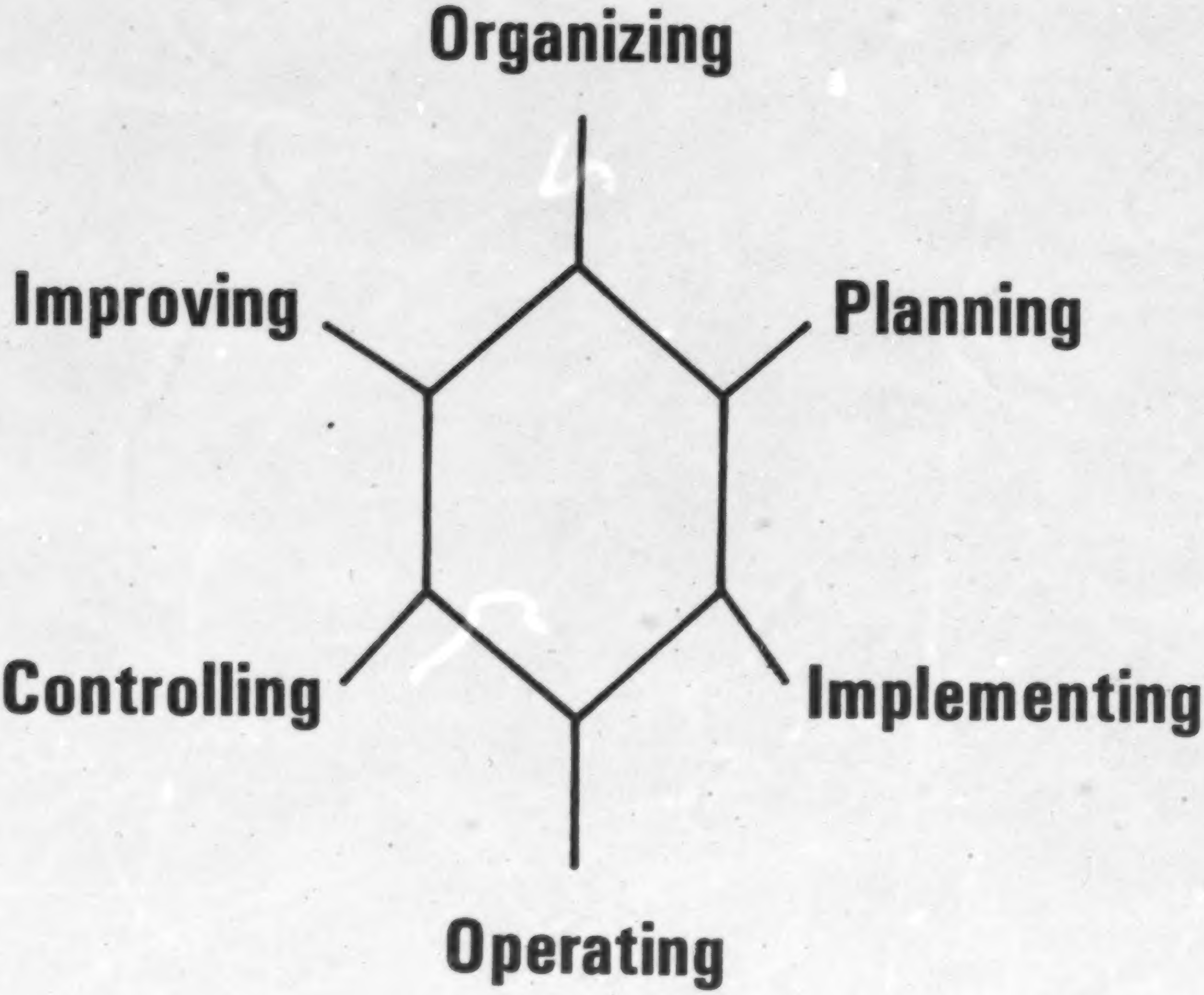
PROPERTY

Holdings or possessions which you or an enterprise have upon which a value can be placed.

MANAGEMENT

The guiding and directing of industrial activities in the most efficient manner.

6 PHASES OF MANAGEMENT



Organizing

Planning

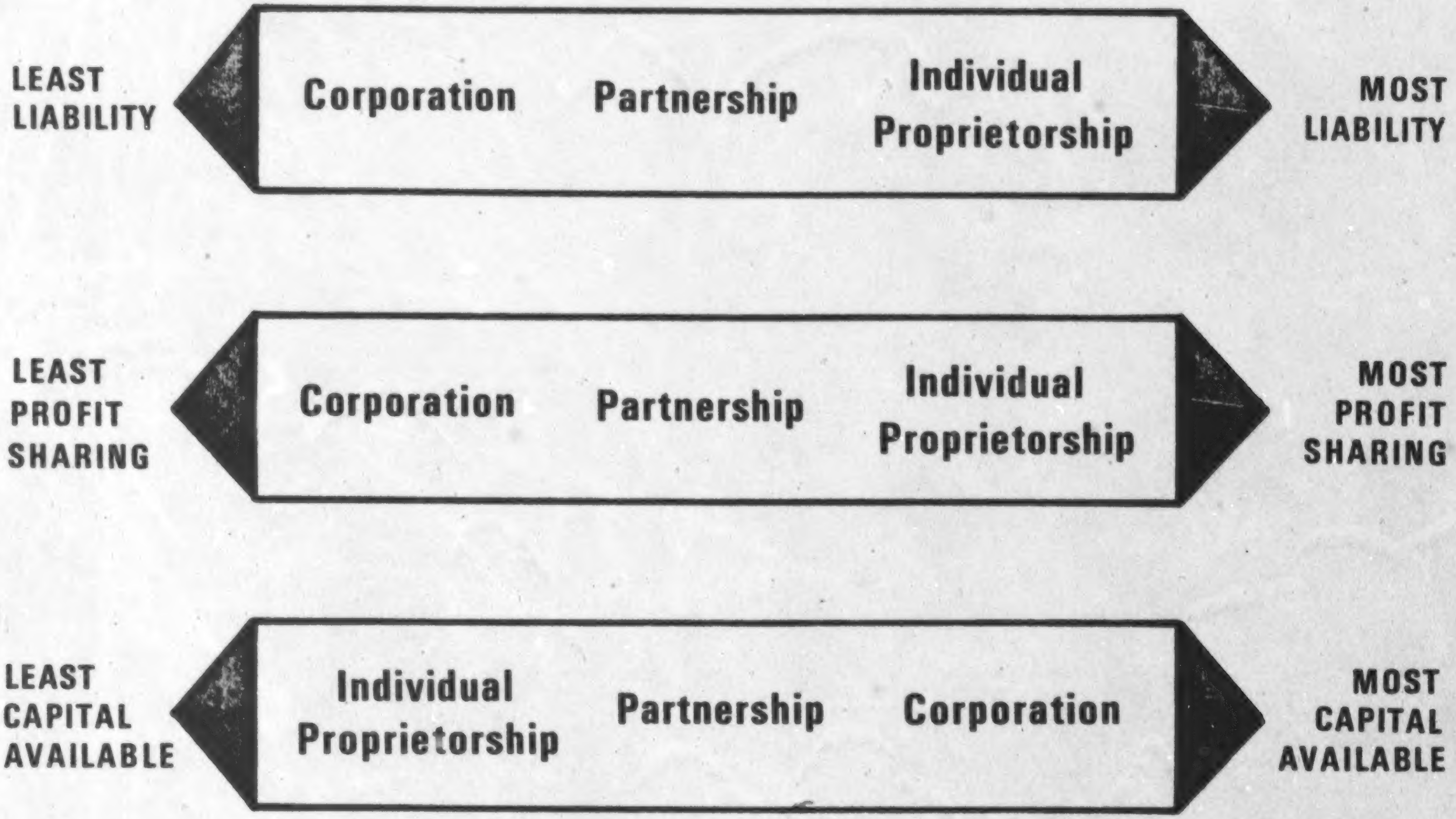
Implementing

Operating

Controlling

Improving

INDUSTRIAL OWNERSHIP



LEAST LIABILITY — Corporation — Partnership — Individual Proprietorship — MOST LIABILITY

LEAST PROFIT SHARING — Corporation — Partnership — Individual Proprietorship — MOST PROFIT SHARING

LEAST CAPITAL AVAILABLE — Individual Proprietorship — Partnership — Corporation — MOST CAPITAL AVAILABLE

MANAGEMENT DECISION MAKING

"DECIDE" FORMULA

D — Define the problem.

E — Enumerate the decision factors.

C — Collect relevant information.

I — Identify the best alternative.

D — Develop and implement a plan for alternative.

E — Evaluate the decision.

Desert Crash

Procedure: Suppose you and a friend were involved in an air crash over a desert. The two of you were the only survivors. When the plane crashed, much of the equipment aboard was damaged. For the two of you to survive, you must walk 150 miles to get out of the desert. Below is a list of 15 items undamaged from the crash. Both of you must go together to make it out of the desert to safety. Your task is to rank the items below in order of importance to take with you. Place number 1 in front of the most important and 15 in last. You should rank all items, with the number between 1 and 15.

___ Box of matches

___ Food concentrate

___ 50 feet of rope

___ Parachute silk

___ Two .45 calibre pistols

___ 3 cases of coke

___ One tank of oxygen

___ A movie projector

___ A map of the area

___ Life raft

___ Compass

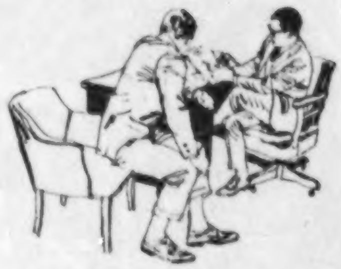
___ 5 gallons of water

___ Signal flares

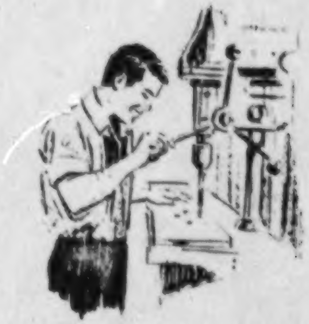
___ First-aid kit

___ Umbrella

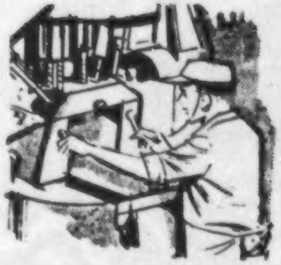
COORDINATING COMMUNICATIONS



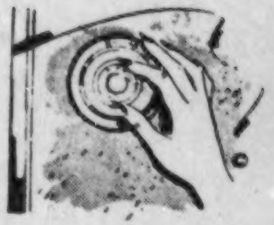
Man — man



Man — machine



Machine — man



Machine — machine

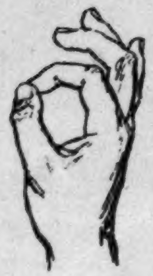
WHAT IS COMMUNICATION ?

Communication is an interaction resulting from the exchange of ideas and information between men and / or machines.

TO COMMUNICATE CERTAIN ELEMENTS MUST EXIST.

Convey ideas ?

Signs and or symbols



Affecting behavior

SOME ESSENTIALS FOR ACCURATE COMMUNICATIONS

Who

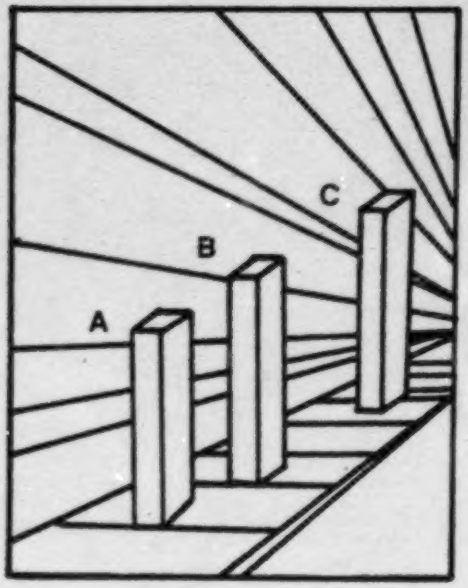
What

When

Where

How

Directions: Answer the following problems.



(a) object A is bigger than B is bigger than C

(b) objects A, B and C are of equal size

(c) object A is smaller than B which is smaller than C

(a) circle "A" is bigger than "B" which is bigger than "C"

(b) circle "B" is equal to circle "C"

(c) circle "B" is equal to circle "A"